DOCUMENT RESUME

ED 367 679	TM 021 119

AUTHOR	Mulcahy, Robert; And Others
TITLE	Cognitive Education Project.
INSTITUTION	Alberta Dept. of Education, Edmonton.
REPORT NO	ISBN-0-7732-1147-0
PUB DATE	93
NOTE	443p.; For the summary report, see TM 021 127.
PUB TYPE	Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC18 Plus Postage.
DESCRIPTORS	Administrators; *Cognitive Processes; Elementary Education; *Elementary School Students; Foreign Countries; Gifted; Grade 4; Grade 7; *Instructional Effectiveness; Learning Disabilities; Longitudinal Studies; Metacognition; Motivation; Parents; Program Evaluation; Reading Comprehension; Symbolic Learning; *Teaching Methods; *Thinking Skills
IDENTIFIERS	Alberta; Feuerstein (Reuven); *Instrumental Enrichment; *Strategies Program for Effective Learning Thinking

ABSTRACT

The Cognitive Education Project centered at the University of Alberta undertook a 3-year longitudinal evaluation of two cognitive education programs aimed at teaching thinking skills. The critical difference between the two experimental programs was that one, Feuerstein's Instrumental Enrichment (IE) method was taught out of curricular content, while the other, Strategies Program for Effective Learning/Thinking (SPELT), was taught directly within curricular content. The effectiveness of these two programs was compared with traditional instruction at grades 4 and 7 for 900 gifted, learning disabled, and normally achieving students. Results indicate that cognitive education was effective in improving student thinking, especially for the grade-4 learning disabled students, and to a lesser extent for the gifted students, in reading comprehension and comprehension monitoring. The SPELT program tended to produce more positive changes than did the IE program, and SPELT was better received by teachers, parents, and administrators, although both programs were favorably received. Eleven tables and 40 figures present study findings. Twelve appendices include questionnaires, observation forms, anova tables, and teachers' parents' and principals' perceptions of the Cognitive Education project. (Contains 149 references.) (SLD)

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Cognitive Education Project

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Cognitive Education Project

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PLEASE NOTE

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Alberta Education Cataloguing in Publication Data

Mulcahy, Robert
Cognitive education project.

ISBN 0-7732-1147-0

1. Affective education – Testing. 2. Cognitive learning. 3. Cognitive learning – Testing. 4. Cognitive styles. 5. Learning, Psychology of. 6. Thought and thinking. I. Title.

LB1590.3.M954 1993 370.152

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ACKNOWLEDGEMENTS

Members of the research team are grateful for the cooperation they received from numerous individuals and school jurisdictions throughout the five years of the Cognitive Education Project. The teachers in north-central Alberta provided important feedback and interaction throughout the study; without their cooperation, particularly in the areas of testing, inservice training and program evaluation, the study would have been impossible to implement.

In particular, our appreciation goes to students, teachers, and administrators, in the following school jurisdictions that participated in the study:

County of Athabasca #12
County of Leduc #25
County of Lamont #30
County of Ponoka #3
County of Parkland #31
County of Two Hills #21

Edmonton Public School District # 7
Leduc School District #297
St. Albert School District #3
Stettler School District #1475
Wetaskiwin School District #264
Red Deer Roman Catholic Separate School District #17

Lac La Biche School Division #51
Sturgeon School District #24
Wainwright School Division #32
Westlock School Division #37
Yellowhead School Division #12

We wish to acknowledge the guidance of the Steering Committee of the Cognitive Education Project. We thank them for their suggestions throughout the undertaking. The members were:

Nelly McEwen (Chair)
Glen Miller
Dale Bjornson
Sandra Pace
Clarence Rhodes
Tom Blowers
Doug Fleming
Janice Leonard

Special mention is made of two individuals who were centrally involved in the study. We express our thanks for their sincere interest, helpful support and advice: Dr. Clarence Rhodes and Dr. Nelly McEwen, of the Planning and Policy Secretariat, Alberta Education.

The project team would like to acknowledge the Faculty of Education and the Department of Educational Psychology at the University of Alberta; in particular, Drs. H. Zingle and G. Romaniuk, successive chairmen of the Department of Educational Psychology during the course of the study, for their accommodation and support.

Miss Sandra Covassi, a research assistant throughout the course of the study, provided valuable assistance in numerous areas such as researching, editing, typing, correcting, preparing graphs, and adding interpretive insight, to name just a few. The research team wishes to record its appreciation for these substantial contributions.

For sharing his statistical expertise, we thank Dr. Tom Maguire; for his input on the original research proposal, we acknowledge Dr. G. Mancini.

We appreciate the contribution of Mr. John Reid, the Instructional Coordinator, and Inservice trainer for the I.E. experimental condition. For assistance in inservice preparation, preparation of materials, and for being generally helpful we offer sincere thanks to Cheryl Kuen, Helen Henderson and Elaine Rino.

For administering detailed aspects of the study over a four-year period at the University of Alberta's Department of Educational Psychology, we are extremely grateful to Judy Maynes. To Helen Dietrich for her skill and patience in typing numerous drafts of the manuscripts, we express our thanks.

The principal investigator would like to express his appreciation to his colleagues at the University of Alberta and elsewhere who offered their professional and moral support throughout the study, in particular Dr. Fred French who was instrumental in the development of the initial research proposal leading to this study.

A study of this magnitude required the assistance of other individuals too numerous to mention, whose contributions we very much appreciate.

ABSTRACT

The numerous reasons for teaching thinking have been tied to the perceived needs of the present and future technological society. Expectations are placed on individuals to be self-sufficient, responsible citizens, and part of an efficient work force, oriented toward an information age. Endorsement of this objective and attempts to teach thinking have resulted in the proliferation of many learning/thinking programs. Few studies to date have, however, systematically and longitudinally evaluated any of the available programs to determine which ones are most effective and most easily integrated into the regular school curriculum. More importantly, there is little empirical data comparing the efficacy of the programs at different grade levels or with different types of learners.

The purpose of the Cognitive Education Project, centered at the University of Alberta, was to undertake a three-year longitudinal evaluation of two cognitive education programs. The critical difference between the two experimental programs was that one (Feuerstein's Instrumental Enrichment - I.E.) was taught out of curricular content, while the second program (Strategies Program for Effective Learning/Thinking - S.P.E.L.T.) was taught directly within curricular content.

Specifically, the effectiveness of the I.E. and S.P.E.L.T. cognitive education programs was compared with traditional instruction at two initial grade levels (grades 4 and 7) for three diagnostic groups (gifted, learning disabled and normal achievers). The comparison was done in terms of:

a. the effects of the programs on students' affect and motivation, academic achievement, cognitive ability, and learning/thinking and problem solving strategies;
b. the differential impact of the programs;
c. the feasibility of implementing learning/thinking strategies instructional programs as part of the regular curriculum of schools; and
d. identifying appropriate methods for providing the level and quality of teacher training necessary for implementation.

These general objectives gave rise to a number of questions spanning student, teacher, parent and administrator responses. The study was implemented in two phases starting in 1984 and 1985 respectively and overlapping, with phase 1 ending in 1987 and phase 2, in 1988. It utilized a repeated measures factorial design involving three types of instructional programs, three categories of students, and two initial grade levels (grades 4 and 7). The complete study provided four data points.

In the course of the implementation, teachers of the control condition taught as usual, whereas teachers assigned to the two cognitive education procedures received intensive inservice training prior to classroom strategy instruction.

In identifying subjects for the study, intellectual, academic and behavioral characteristics were used, resulting in the selection of 900 students from an initial population of 4,000. Based upon intelligence test scores and achievement three groups of subjects were identified as gifted, average and learning disabled.

Apart from obtaining responses from students, questionnaires were administered to teachers, parents and administrators to assess their perceptions of the different programs. The results of the study indicate that:

1. Cognitive education was effective in improving student thinking, especially for the grade 4 learning disabled, and to a lesser extent the gifted, in reading comprehension, and comprehension monitoring skills. Students' strategic behavior generally improved across grade and diagnostic groups.

2. Though I.E. was effective, S.P.E.L.T. tended to produce more positive changes in students' overall performance.

3. Teachers', parents', and administrators' responses were positive towards the two cognitive education programs, with more favorable remarks being made for S.P.E.L.T. The teachers involved in the study indicated general appropriateness of both experimental programs especially for grade 4 students. The vast majority of experimental teachers said the inservices provided were appropriate and that they would continue to use the instructional procedures from their respective program. As well, the teachers said they would recommend the two programs to their colleagues. Parents also indicated observation of positive changes in their youngster's self-confidence, task persistence, accepting alternative points of view, originality of thinking and questioning, etc.

4. The question of whether either of the cognitive education programs was more effective for specific groups of children did not receive a definitive answer and may have to be further examined. On the whole, the experimental programs appeared to be most effective for learning disabled students, and to a lesser extent, the gifted at both grade levels.

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ORGANIZATION OF THE REPORT

The report is organized into three parts and nine chapters. Part One -- theoretical considerations -- contains chapters 1, 2, and 3. In Chapter 1 an overview of the project is presented. Chapter 2 contains a discussion of the foundations of teaching learning/thinking skills and related issues, thereby providing a theoretical framework used in the study. Chapter 3 describes the two selected cognitive education programs, I.E. and S.P.E.L.T., detailing their characteristics, goals, teaching methodologies, inservice training, and evaluation procedures. Part Two -- methodology -- contains chapters 4, 5, and 6. The design of the investigation, and the test instruments used in the study are described in Chapter 4 and Chapter 5 respectively. Chapter 6 presents the details of the pre-test analyses with remarks on subject attrition. The final three chapters constitute Part Three -- results -- of the report. The experimental results of the study are reported in Chapter 7. In Chapter 8 the details of teachers', administrators', and parents' perceptions of the project are presented. Finally, in Chapter 9 the summary of the results of the investigation and suggestions for future research for classroom practice are provided.

PART ONE - THEORETICAL CONSIDERATIONS

Part One contains three chapters. Chapter 1 presents an overview of the project. Chapter 2 discusses foundations of teaching learning/thinking skills and related issues, thereby providing the theoretical framework used in the study. Chapter 3 describes the two selected cognitive education programs, I.E. (Instrumental Enrichment) and S.P.E.L.T. (Strategies Program for Effective Learning/Thinking), detailing their characteristics, goals, teaching methodology, inservice training, and evaluation procedures.

CHAPTER I
INTRODUCTION

Rationale

Over the past decade, advances in cognitive psychology have emerged in both applied and 'basic' settings, which indicate that our ability to develop students' higher cognitive processes may be improved. In the field, there has been a significant increase in interest and desire from school teachers, school districts, colleges, and universities, to find ways of increasing their students' capacity to learn and think more effectively. This has been coupled with recent advances in behavioral research with respect to human development, problem solving, learning processes, and affective learning and development.

The above interest and new knowledge have resulted in an educational movement which emphasizes the need for, and the importance of, teaching learning/thinking skills. In recent years there has been an emergence of various cognitive education programs aimed at enhancing students' cognitive and metacognitive skills with the hope that students become more independent learners and more efficient problem solvers. Mainly these programs are based on the general information processing conceptualization of learning as a process in which the planful, organized, and independent activity of the learner is of central importance. These programs range from developing intellectual competence (e.g., Feuerstein, Rand, Hoffman, & Miller, 1980; Sternberg, 1986), operational reasoning (e.g., Nickerson & Adams, 1983; Lipman, Sharp & Oscanyan, 1980) and problem-solving ability (e.g., de Bono, 1980; Meichenbaum & Asarnow, 1979), to more procedural techniques and skills for mastering academic material (Dansereau, 1984; Deshler & Schumaker, 1986; Weinstein & Underwood, 1985).

Although cognitive education programs have been growing in quantity and popularity, many questions concerning their effectiveness remain, due to the lack of long term evaluation. First, the packages available today tend to vary in terms of scope, skill development, age/grade suitability, training requirements, curriculum integration, cost, and instructional methodology (Chance, 1986; Nickerson, Perkins, & Smith, 1985). Few studies to date have systematically evaluated any of these available programs to determine which are most effective and/or most easily integrated with the regular school curriculum (Snow, 1982). More importantly, there is little empirical work comparing the efficacy of the programs at different grade levels for different types of learners. In addition, when reviews of research are conducted the results are often equivocal with regard to program effectiveness (see Savell, Twolhig, & Rachford, 1986).

In the educational context, the central issue is, therefore, not to decide whether or not to teach learning/thinking skills to students, but how to teach them. In view of the diversity of the available programs, selecting a program to put in place can be a challenging endeavor. Taking various factors into consideration, the "approach" issue becomes the greatest concern. That is, which approach -- in-content or out-of-content instructional approach -- would work better for students? Would there be differences if we compare these two approaches at different grade levels for different types of learners? Basing our conclusions and subsequent action on subjective preferences alone will not stand the scrutiny of the public nor posterity. The appropriate course of action is to conduct an evaluation study, putting in-content and out-of-content programs in place in selected schools and then evaluating the results. With this main purpose in mind, the Cognitive Education Project (C.E.P.) was inaugurated in the Fall of 1984.

Objectives

The Cognitive Education Project was a cooperative venture involving:
1) the Department of Education, the Government of Alberta; 2) Department of Educational Psychology, the University of Alberta; and 3) various school jurisdictions in north-central Alberta. It was established with the general purpose of undertaking a long-term evaluation of two cognitive education programs (out-of-content versus in-content) in relation to traditional instruction in elementary and junior high classrooms.

For the out-of-content approach, Feuerstein's Instrumental Enrichment (I.E.) (Feuerstein, Rand, Hoffman, & Miller, 1980) was selected because of its popularity, its level of conceptual and empirical development, its potential for success, its use of supporting materials, and, because it appears to represent the current state of the art in the field. In brief, Instrumental Enrichment is one of the most comprehensive and field tested learning/thinking programs available to date. It is an out-of-content instructional approach utilizing paper-pencil tasks and intensive teacher-pupil discussion to teach learning/thinking skills.

In contrast, the Strategies Program for Effective Learning/Thinking (S.P.E.L.T.) (Mulcahy, Marfo, & Peat, 1984; Mulcahy, Marfo, Peat, & Andrews, 1987) was chosen because it emphasizes the teaching of learning/thinking strategies directly within content across the curriculum, and because it integrates the work of Vygotsky (1962), Luria (1960), Brown (1980), Flavell (1977), Meichenbaum (1977), Deshler (Deshler, Alley, Warren, & Schumaker, 1980), and Bandura (1978). S.P.E.L.T. is unique in its attempts to enhance students' learning/thinking skills through student generated activities. Therefore, it was felt that S.P.E.L.T. would provide an important research comparison.

Thus, though the common goal of the two selected programs is, ultimately, to help students learn 'how to learn' and become independent, organized, active, and purposeful thinkers and problem solvers, the major difference between the two programs is the teaching of thinking out of curriculum content (I.E.) versus the teaching of thinking within curriculum content (S.P.E.L.T.).

An assessment of the effectiveness of the I.E. and S.P.E.L.T. cognitive education programs was compared with the effects of traditional instruction at two initial grade levels (grades 4 and 7), for three diagnostic groups (gifted, learning disabled and average achievers). Specifically, the objectives of the project were fourfold:

(a) to assess the relative effectiveness of the two programs in terms of their impact on students' affect and motivation, academic achievement, cognitive ability, and learning, thinking, and problem-solving strategies,

(b) to examine the differential effects of the programs, on gifted, average achieving, and learning disabled students,

(c) to ascertain the feasibility of implementing learning and thinking strategies instructional programs on a large scale as part of the regular curriculum of schools, and

(d) to identify appropriate methods for providing the level and quality of teacher training necessary for implementation.

Research Questions

In response to the objectives listed in the preceding session, the following research questions were formulated.

1. What are the effects of the different cognitive education programs versus traditional instruction on gifted, learning disabled, and normal achievers with respect to the following measures?

    a. perceived competence
    b. perceived locus of control
    c. performance in reading comprehension
    d. performance in arithmetic problem solving
    e. use of specific strategies employed in solving problems.

2. Is/are the training program(s) more appropriate at different ages for the three diagnostic groups?

3. For each of the two cognitive education programs, do the pupils continue to maintain their level of performance following the termination of training?

4. What is the nature of strategy monitoring for each of the three diagnostic groups across the different age/grade groupings? To what extent can the cognitive education strategy programs be implemented according to design?

5 What is the nature of the strategies utilized by each of the groups across the different age/grade groupings prior to instruction and at the conclusion?

6. What are parents', teachers', and administrators' (consultants') opinions regarding the cognitive education programs?

7. What are the teachers' and administrators' (consultants') opinions regarding inservice and consultative assistance provided for cognitive education programs?

8. What guidelines for preservice and inservice programs for teachers seem appropriate?

9. How well do teachers learn and implement the cognitive education strategies? How appropriate and effective is the inservice and consultation provided?

Basic Assumption

The basic assumption of the two selected cognitive training programs is that what we have come to know as "intelligence" is subject to improvement by training. This is not a minor assumption given the view that "intelligence" is frequently considered to be a static quantity. For example, Bloom (1981) has suggested that while intellectual plasticity is greater in early life, little plasticity is possible thereafter. Such a belief may have impacted on increased early intervention. In contrast, strategies for intervention in adolescent and later years have probably been inhibited by such a philosophy. More recently, however, Brody and Brody (1976) wrote that the notion of cognitive plasticity was a matter of speculation given the lack of concrete data to support such a conjecture.

It is not the intent of this brief section to enter into each of the many debates over the nature of intelligence. For the purposes of this project and in the light of recent research in the area of cognitive education, intelligence is conceptualized as the summation of learning experiences. This is similar to Wesman's (1968) and Ferguson's (1963) notion of intelligence. As Wesman (1968) noted, intelligence is a hypothetical construct. Such constructs, while generally capable of measurement, may not exist as an entity. Rather, through repeated use they become reified and undertake a static substance like quality. A more benign and constructive philosophy particularly for educators has been offered by Staats, Brower & Gross (1970). He wrote that the nature of intelligence may include the notion of an inherited biological structure that fits individuals for learning. However, the nature of intellectual growth will depend greatly on the nature of and the opportunities to engage in learning experiences. It is from this basic assumption that Feuerstein's Instrumental Enrichment (Feuerstein, Rand, Hoffman, & Miller, 1980) has evolved. This is also the basic assumption from which S.P.E.L.T. was developed.

Definitions

Most of the terms relevant to the project will be elaborated and clarified in Chapter 2. However, for reference purposes, the definitions of several key terms are briefly summarized as follows.

Cognition

In this project, cognition refers to effortful acquisition, retention, retrieval, and use of academic and social knowledge. Accordingly, such terms as learning, remembering, understanding, and problem-solving in academic and social contexts can be subsumed under the notion of cognition.

Metacognition

Metacognition involves thinking about one's own learning, remembering, and understanding. The term, meaning cognition about cognition, refers to one's knowledge and control of his/her own cognitive activities. Integrating the views of Flavell (1981) and of Brown (1980), metacognition involves two components. First, metacognitive knowledge, or knowledge about cognition, refers to one's knowledge about his/her own cognitive resources, about task demands, and about strategies needed to effectively perform a cognitive task. Second, metacognitive experience, or control/regulation of cognition, refers to one's ability to manipulate and regulate his/her own cognitive resources and strategies to ensure the successful completion of a task. These two components of metacognition are assumed to interact with each other as they influence one's cognitive activity.

Cognitive Education

Cognitive education "refers to any effort on the part of the teacher or the use of instructional materials to help students process information in meaningful ways and become independent learners. This definition includes efforts to help students construct meaning from reading, solve problems, develop effective reading/thinking/learning strategies, select appropriate strategies, and take responsibility for their own learning as well as to transfer skills and concepts to new situations" (Jones, 1986, p.7).

Learning

In this project, learning is defined as a relatively permanent change in potential performance or behavior as the result of experience (Shuell, 1986). Moreover, learning has the following characteristics: it is goal oriented, strategic, links new information to prior knowledge, gets knowledge organized, and is influenced by development.

Thinking

The current literature on thinking reveals that little agreement exists as to what the underlying processes of thinking are. It can be said that, due to the generic, complex, and multi-faceted nature of thinking processes, thinking is difficult to define. However, two major unifying strands appear to run though the complex thinking tapestry. That is, nearly all researchers in this area acknowledge the central importance of metacognition and the role of content-area knowledge in the development of thinking. This points to the importance of continued research and program development emphasizing these two areas.

Strategies

Strategies are ways to facilitate the acquisition, manipulation, integration, storage and retrieval of information across situations and settings (Alley & Deshler, 1979).

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this chapter is to delineate the need for the teaching of learning/thinking skills, to discuss some controversial issues, and to review several prominent cognitive education programs pertinent to the study. The chapter contains four parts. In the first section, the conceptual and research foundations of teaching learning/thinking skills are analyzed. It is followed by a discussion of issues involved in teaching learning/thinking skills, including the examination of the conceptualization of thinking, the role of metacognition, the role of content-area knowledge, the role of motivation, and program evaluation as they relate to the development of thinking. To reflect the current state of the art, several prominent cognitive education approaches are reviewed in the third section. The final section of the chapter presents implications drawn from the literature that provide guidelines for the design of the project.

Foundations of Teaching Learning/Thinking Skills

The interest in cognitive training procedures is not a new phenomenon in education. As early as the 1880s, programs that promised the enhancement of mental abilities were well established (Mann, 1979). It should be noted, however, that the contemporary focus on teaching learning/thinking skills is distinguished from early antecedents in two ways. First, current emphasis attempts to address the process aspect over the product aspect (Glaser, 1984; Nickerson, 1988), including a growing commitment to the view that achievement, especially at school, is not a fixed, stable or immutable state, and that performance levels are susceptible to modification. Secondly, while over the past centuries, the teaching of higher-order thinking skills has been a goal, it was not in connection with mass education but with elite education that it thrived (Resnick, 1987). Most current cognitive training programs are appropriate for all school-aged or college students, with some programs especially designed for learning disabled or mentally handicapped individuals. Why is there such a strong renewed interest in teaching learning/thinking skills? An in-depth analysis of our society and a review of research evidence reveal that there are at least four reasons: a) the characteristics of present and projected future societies point to the need for good learners and thinkers, b) the investigation of present teaching practices shows them to be lacking, c) an analysis of students' thinking capabilities and performance indicates improvement is needed, and d) empirical data strongly support cognitive interventions.

Characteristics of Present and Future Societies

Our world has entered the "post-industrial, information age in which a large proportion of workers are now involved in processing and communicating information, a trend likely to continue and accelerate" (Chance, 1986). In some fields, the time period during which half of the information becomes outdated is as little as six years. Students can thus no longer keep pace with the constantly changing content of a subject area. They now must also acquire life-long *learning/thinking* skills, skills considered necessary to acquire and process information within ever-expanding fields of knowledge (Maher & Schwebel, 1986; McTighe & Schollenberger, 1985; Mulcahy, Andrews, & Peat, 1990; Nickerson, 1990). In line with this argument, recent publications on learning/thinking skills have adopted the position that a more appropriate goal of primary and secondary education today is to produce *learners* --who have the motivation and ability to learn on their own--rather than to produce *learned* individuals (Marzano et al., 1988; Nickerson, Perkins, & Smith, 1985).

Moreover, one basic foundation of our democratic society is the existence of an informed and intellectually able citizenry. The ability to think critically about issues enhances the individual contributions to the solution of local and national problems (McTighe & Schollenberger, 1985). In this regard, Nickerson (1986) has succinctly argued for the importance of teaching critical thinking related to the survival of our globe. He contends that the unparalleled complexity and threatening nature of some current national and world problems are not because of a lack of raw intelligence or technology, but are "direct consequences of our cleverness and technological wizardry" (p. 32). "We are now smart enough to destroy ourselves as a species," Nickerson comments, "and, unless we learn to be better thinkers in a broad sense, we may well do so" (p. 32). He continues to elaborate the need for teaching thinking skills. In his view, the ability to learn and to think is essentially human. Homo sapiens, like no other species, is expected to rely more on cognition and less on instinct. Accordingly, students who become good learners and thinkers are more fully expressing what it means to be human. In this context, Nickerson (1986) points out, "thinking well is a means to many ends, but is also an end in itself" (p. 32).

In short, facing the information explosion of this time era and the complexity of various national and world problems, the need for enhancing our students' critical thinking abilities appears to be imperative.

Present Teaching Practices

Our analysis of the characteristics of present and future societies, in the previous section, has indicated that students need to develop their learning/thinking skills. How, then, do teaching practices influence the development of student thinking and learning?

Several approaches have been used for investigating teaching practices. The behaviorists' Stimulus-Response (S-R) paradigm is one dominant research approach employed in studies which relate various characteristics of teaching indirectly to student achievement. For instance, emphasizing the reinforcement aspect of teacher praise, research based on the S-R paradigm reported a positive relationship between teacher praise and learning. This body of research suggested that teacher praise should be used frequently, contingently, and discriminatively. To a large extent, the behavioral approach has produced an orderly knowledge base linking teacher behavior to student achievement for the teaching profession to draw upon (Brophy, 1986; Brophy & Good, 1986; Brophy & Porter, 1988). However, it fails to account adequately for what takes place in the students' minds which, in turn, influences performance.

The cognitive perspective, in contrast, helps explain why different teacher behaviors have differential effects, and how students' thought processes affect their performance. For example, the types of questions teachers use have been demonstrated to have direct influence on student achievement. As well, a question can have differing effects on different subgroups of students. Rephrasing questions and giving more time to answer are effective with 'low-ability' students. On the other hand, the gifted perform better if the questioning proceeds at a quick pace, and when inferior work is periodically criticized (Bachor, 1985). These questioning techniques also give information to the students as to the teacher's expectations. For the 'low ability' students the teacher's questioning behavior tells them that they are expected to think and that they will be provided with the time to think through a response. For the gifted, the students perceive the teacher's questioning behavior as challenging them to think quickly, and at a high level. In other words, teacher's questioning behavior, if well directed, is intended to facilitate students accepting information, processing or comparing that information with what they already know, drawing meaningful relationships, and applying or transferring those relationships to hypothetical or novel situations.

Teaching practices, then, influence students' thinking which, in turn, affects students' performance. Knowing this, many teachers value the teaching of thinking as an educational goal and use methods that facilitate its development. However, these teachers are not the norm. Most teachers do not employ techniques and approaches which facilitate the development of thinking in their students (Joyce & Weil, 1986; McTighe & Schollenberger, 1985).

Students' Thinking Capabilities

If common teaching practices do not help foster students' thinking skills, it is not surprising then that most students do not learn and think as effectively as they could (Marzano et al, 1988; Nickerson, 1990). Numerous reports published in recent years support such speculation. For example, Norris (1985) reviewed research in the area of critical thinking and concluded that the level of students' critical thinking is not extremely high at any level of schooling, including university students enrolled in MBA and medical programs. The American *National Commission on Excellence in Education* (Goldberg & Harvey, 1983) reported that many 17-year-olds do not possess the higher-order intellectual skills expected of them; nearly 40 percent cannot draw inferences from written materials, only one fifth can write a persuasive essay, and only one third can solve a mathematics problem requiring several steps. The examples go on and on (see Chance, 1986).

Efficient learning/thinking is lacking even more in learning disabled students. They have been found to be strategy inefficient or deficient in that they: (a) are unable to monitor their reading comprehension to ensure that they are obtaining meaning from the text (Wong, 1985); (b) are often unable to apply task-appropriate strategies (Torgeson, 1980); (c) have more difficulty in planning organizational strategies for approaching a task (Wong, 1982); (d) fail to engage in strategic behavior in order to restore meaning when there has been a breakdown in understanding some; and (e) fail to change or modify their strategies to meet varying task demands (Palinscar & Brown, 1987).

Given the above research evidence, it seems clear that it is not only important to improve the learning/thinking skills of 'regular' students, but even more so for those with learning difficulties. The remaining question is, can students' learning/thinking skills be improved?

Empirical Data

Research clearly points to the effectiveness of cognitive interventions with differing populations (see Deshler, Warner, Schumaker & Alley, 1983; Hallahan, et al. 1983 [Learning disabled]; Scott, 1988 [Gifted]; Dansereau, 1985; Weinstein, 1982 [College students]; Brown & Campione, 1977; Mulcahy, 1980 [Mentally retarded]), and within a wide assortment of subject areas (see Jones, Palinscar, Ogle, & Carr, 1987; Nickerson,I 1990; Schoenfeld, 1985; Wittrock, 1986). Research at the University of Alberta over the past few years has also supported the need for, and the utility of a strategy approach in educational intervention (i.e., Andrews, 1984; Lupart & Mulcahy, 1983). Jones (1986), in summarizing the findings of various intervention studies, concluded that:

> Cognitive instruction has the potential to alter substantially the capability of the learner, especially the low-achieving learner, in much the same way that microchips radically altered the capability of the computer..... Explicit learning strategy training facilitates learning for low-achieving students, and there are strong data to suggest that cognitive instruction decreases the differences between younger and older students (pp. 8-9).

In sum, the above analysis of the conceptual and research foundations of teaching learning/thinking skills have revealed that, in order for students to function in the present information age and be able to tackle the complex problems facing them as citizens of the twentieth and twenty-first centuries, it is necessary to teach them thinking skills. However, present teaching practices, generally, do not reflect the use of methods and techniques which facilitate the development of students' thinking skills. As well, the present level of students' thinking is not at an optimum level. On the other hand, interventions have shown to be effective in improving the thinking abilities of students. Such an analysis implies that the teaching of learning/thinking skills should be a major educational goal.

In line with this, a task force (Nickerson, Perkins, & Smith, 1985), .evaluated the status of the teaching of learning strategies and thinking in the United States and recommended:

(1) the need for more research on learning/thinking strategies, particularly with respect to enhancement of student performance through training;

(2) the need for more emphasis on facilitating the transfer of research results to classroom practice; and,

(3) the need for the teaching of learning/thinking strategies to be closely coupled with the teaching of conventional content material.

These recommendations reinforce the need for a more collaborative effort in research on student cognitive development, and especially for those working with students with learning difficulties (Mulcahy, Andrews & Peat, 1990).

Issues in Teaching Learning/Thinking Skills

While the foregoing analysis has provided a rationale for the teaching of learning/thinking skills, there are some critical issues which need to be discussed, clarified and resolved, before this teaching can be put into practice.

Conceptualizations of Thinking

When the teaching of learning/thinking skills is put into practice, an immediate question is, **what** kind of learning/thinking skills should be taught. The conceptualization of thinking that we adhere to is a major factor in determining what is to be taught to students at the classroom level. To reveal the current level of understanding in the area of thinking, several prominent researchers' work in this area will be presented.

Nickerson, Perkins, and Smith (1985), for example, have identified thinking skills as:

- The ability to modify behavior adaptively -- to learn;
- The ability to classify patterns -- classification;
- The ability to reason deductively -- application;
- The ability to reason inductively -- generalization;
- The ability to understand -- comprehension;
- The ability to develop and use conceptual models.

Resnick (1987), on the other hand, states that "thinking skills resist the precise forms of definitions we have come to associate with the setting of specified objectives for schooling" (p. 2). She challenges the traditional reductionist view of thinking as a set of 'lower' and 'higher' order skills, with lower presumably needing to be developed first. "The most important single message of modern research on the nature of thinking is that the kinds of activities traditionally associated with thinking are not limited to advanced levels of development." Resnick argues, "Instead, these activities are an intimate part of even elementary levels of reading, mathematics, and other branches of learning -- when learning is proceeding well" (p. 8). In her view, acquiring particular components of thinking does not ensure that an integrated ability to learn, think and reason and a disposition to engage in higher order thinking will emerge.

Due to the above analysis, Resnick labels the term 'higher order thinking' as misleading. Nevertheless, Resnick (1987) has generated a working definition of what she views higher order thinking to be. It is conceptualized as :

- being nonalgorithmic (the path not fully specified in advance),
- being complex (the total path is not mentally 'visible' from any single vantage point),
- often yielding multiple solutions (each with costs and benefits),
- involving nuanced judgment (and interpretation),
- involving the application of multiple criteria (which sometimes conflict with one another),
- involving uncertainty (not everything that bears on a task is known),
- involving self-regulation of the thinking process,
- involves imposing meaning (finding structure in apparent disorder), and
- effort (considerable mental work is involved in complex elaborations and judgments) (p. 3).

Resnick further elaborates the generic nature of thinking processes. She points out that many aspects of powerful thinking are common across situations and disciplines. Particularly, metacognitive skills recur in analyses of complex task performance. Metacognitive skills play an "executive" or regulatory role in thinking, with their use being to keep track of understanding; to initiate review of rehearsal activities as required; and to deliberately organize and control attention and/or other resources to aid in the learning process. If these metacognitive skills and other general thinking skills can be delineated, and if effective ways of instruction are implemented to teach these skills, then a possibility exists for a relatively narrow instructional effort to effect wide, positive learning results. At the same time, cognitive research clearly demonstrates the central role that specific content area knowledge plays in reasoning, thinking and learning in general. This suggests that the teaching of thinking within specific subject area disciplines, with the hope for transfer of these general thinking skills to other disciplines, may be a promising approach.

Based on an extensive review of the thinking literature, Marzano and his associates (Marzano et al., 1988) have presented a framework for thinking "intended to be the basis for curriculum and staff development programs" (p. xi). The authors have identified the following domains of thinking:

- metacognition,
- critical and creative thinking,
- thinking processes,
- core thinking skills,
- the relationship of content-area knowledge to thinking.

Marzano et al (1988), however, caution that:

> (T)hese dimensions do not form a taxonomy. They are neither discrete nor comparable categories. They overlap in some cases, and they relate to each other in different ways. Therefore they do not form a hierarchy. Nor are they intended as ends in themselves. We chose them because they reflect the various domains of thinking as they are understood in terms of current research. Educators can use this framework as a resource to match the demands of the curriculum with the needs of students, knowing that this is a work document that will change as research provides new information. (p. 5)

For these authors, thinking is viewed as being made up of processes and skills. Thinking certainly occurs without instruction, but students' abilities to perform the various processes can be improved by their awareness and practice of the component skills that make up thinking. Moreover, thinking processes are broadly directed towards either knowledge acquisition or knowledge production/application. Concept formation, comprehension and principle formation are processes primarily applied to knowledge acquisition, whereas problem solving, decision making and research processes lean towards knowledge production/application, with the process of oral discourse used in both knowledge acquisition and production/application. These thinking processes are not distinct from one another, but overlap. As well, thinking is not linear because the various skills are used at many different points in the thinking process.

The above analyses of thinking from different researchers, on the whole, reflect the diversity of the current literature on thinking. It can be said that, due to the generic, complex, and multi-faceted nature of thinking processes, thinking is difficult to define. Accordingly, little agreement exists as to what the underlying processes of thinking are. However, two major unifying strands appear to run though the complex thinking tapestry. All the authors cited above acknowledge the central importance of metacognition and the role of content-area knowledge in the development of thinking. In the following sections, these two aspects will be discussed.

The Role of Metacognition

Metacognition is cited by Resnick (1987) and Marzano et al. (1988) as one of the processes that appears repeatedly in analyses of complex task performance. It is defined as, "knowledge and cognition about cognitive phenomena" (Flavell, 1979), "thinking about thinking" or "being aware of our thinking as certain tasks are performed, and using this awareness to control what we are doing" (Marzano et al., 1988).

Two types of metacognitive activities appear to be involved in learning/thinking. The first type of metacognitive activity is concerned with what one does or does not know about the material being learned and the processes involved in learning it, and is referred to as metacognitive knowledge. The second is an 'executive' function which regulates and orchestrates various activities that must be carried out for learning to be successful (Shuell, 1986). In other words, metacognition denotes one's *knowledge and control* of his/her own cognitive activities.

According to Flavell (1984), metacognitive knowledge refers to one's "accumulated declarative and procedural knowledge concerning cognitive matters, and can be divided into three categories: person, task, and strategy" (p. 4). Knowledge of person variables refers to one's knowledge about other persons' or one's own strengths, weaknesses, and skills. Knowledge of task variables is knowledge about the way the nature of the task influences performance on the task. Knowledge of strategy variables is knowledge about which strategies might enhance or detract from performing well on the task. These three variables are assumed to interact with one another to influence performance on cognitive tasks. On the whole, the awareness of one's cognitive processes is the defining feature of this aspect of metacognition.

In contrast, the control function is the defining feature of the 'executive' aspect of metacognition. Whereas Flavell (1984) labels this cluster of metacognitive activities as 'metacognitive experiences', Brown, Campione and Day (1981) identify them as 'regulation of cognition'. This component of metacognition refers to self-regulatory activities (e.g., planning, monitoring, checking, testing, revising, predicting, etc.) used by the learner to orchestrate cognition. Such functions are viewed as essential for learning and are key mechanisms of growth and change.

In recent years much research attention has been focused on metacognitive skills in the effort to understand better the role they play in our thinking and how they might be taught (Nickerson, 1990). These investigations have particularly emphasized the areas of memory and reading. For example, a recent review of the metamemory literature concluded that there is a substantial relationship between one's knowledge of memory processes and performance on memory tasks (Schneider, 1985).

Concurrent with the research work in metamemory, numerous studies on metacognitive aspects of reading have been carried out (cf., Baker & Brown, 1984, Garner, 1982). For instance, a major project was designed and carried out to "test the relation between metacognition and reading comprehension, or more precisely, the relation between children's independent use of reading strategies and their awareness of the existence, application, and benefits of those strategies" (Paris & Oka, 1986). Approximately 500 third-grade and 500 fifth-grade pupils received an experimental curriculum that explicitly taught them to use reading strategies as an adjunct to the regular reading material (Paris & Jacobs, 1984). This study reported that children's reading comprehension could be enhanced with the provision of metacognitive knowledge about effective strategies by their regular teachers, when presented in addition to the usual reading program.

The emphasis on the teaching of metacognitive skills has emerged as a critical component of cognitive instruction because it addresses a perennial educational problem --teaching for transfer. When the conditions of applicability of a learning/thinking strategy are taught along with the strategy (executive skills training), transfer appears to be successful (Belmont, Butterfield, & Ferretti, 1982). Metacognition, therefore, plays a vital role in learning.

The Role of Content-Area Knowledge

Another issue revealed in our previous discussion of current conceptualizations of thinking is the role of content-area knowledge in the development of thinking skills. This issue concerns curriculum integration -- the integration of the teaching of learning/thinking skills into the regular classroom curriculum. Cognitive education programs, consequently, can be classified according to their degree of integration with regular school curriculum. Whereas detached programs, taking an 'out-of-content' approach, are taught outside of curriculum content, embedded programs, adopting a 'within-content' approach, are taught using curriculum material. How does this embedded-detached factor affect the efficacy of learning/thinking program instruction?

Some researchers propose that an 'out-of-content' approach may be most appropriate for some individuals, such as pre-school youngsters, culturally deprived adolescents, or some "working adults" (Mulcahy & Marfo, 1987). For others, perhaps average-achieving students, learning disabled and/or college students, an 'in-content' mode might be most appropriate. The best solution may be to implement programs on the basis of a continuum, beginning out-of content and then gradually integrating the explicit teaching of learning/thinking skills into the curriculum context. Using this approach, it would be necessary to make allowances for movement in and out of content at any level, according to need (for example, pre-school, elementary, high school, vocational and college or university) (Mulcahy, Andrews, & Peat, 1990).

Presently there seems to be widespread support for using content material as the instructional vehicle (Bransford, Sherwood, Vye, & Reiser, 1986; Brandt, 1988; Chambers, 1988; Chance, 1986; Glaser, 1984; Presseisen, 1988; Resnick, 1987; Mulcahy, Peat, & Darko-Yeboah, 1986). The question of which direction is the best, however, has not yet been fully answered, since there is little comprehensive longitudinal research data available comparing the differential effects of these differing procedures with students of various ability and age levels and with control groups (Harris, 1988; Nickerson, Perkins, & Smith, 1985).

The Role of Motivation

Some of the available cognitive education programs, seem to emphasize motivational components in their design, particularly those working with exceptional groups, while others de-emphasize this variable. Pressley, Goodchild, Fleet, Zacchowski & Evans (1987) state that there is a "great need in general for re-engineering classrooms so that motivation is enhanced" (p. 51). A few researchers have begun to examine the role of motivation in the teaching of learning/thinking with various students populations (Paris & Oka, 1986; Mulcahy, Andrews, & Peat, 1990), but data in this area are sparse. This issue appears to be of primary importance, particularly for those with learning difficulties because "emotional and motivational variables are central to some if not all learning disabilities, either as initial causes or as factors that exacerbate problems that are based on neurological deficits" (Deci & Chandler, 1986, p. 587). Systematic and comprehensive research in this area is sorely needed to facilitate the redesign of classrooms to enhance motivation.

Program Evaluation

In addition to the above concerns, another issue involved in teaching thinking/learning skills is the evaluation of program effectiveness. Resnick (1987) identifies the development of appropriate evaluation strategies as an important challenge facing the movement for improving the teaching of thinking. Mastery performance (i.e., exercises similar to the program itself) is the most common form of assessment reported when evaluating various cognitive education programs. Although a first step in evaluation, mastery performance assessment tells us little about the ability of the programs to affect thinking performance beyond the course of the program (i.e., generalization), over time.

Assessment of cognitive ability should place greater emphasis upon cognitive processes and strategies that underlie learning and performance (Mulcahy & Marfo, 1987). Much work is still necessary, in order to evaluate program effectiveness and to establish instructional priorities. Although promising efforts are being made to develop standardized strategy and process measures (Biggs, 1987; Feuerstein, Rand, & Hoffman, 1979; Mulcahy, Andrews, & Peat, 1990; Paris & Oka, 1986), the evaluation of any educational intervention is beset with numerous difficulties. Nickerson (1990) points out that: "There are variables that cannot, perhaps some that should not be controlled" (p. 39). The inherent problems involve a variety of variables such as:

(a) selecting the most appropriate criterion measures to use;
(b) determining whether a program has been implemented as the developer(s) intended; and
(c) determining the effect of quality of teaching towards the success or failure of any program.

The difficulty of obtaining unequivocal evaluation data is illustrated by the numerous attempts to evaluate the effectiveness of Feuerstein's Instrumental Enrichment Program (see chapter 3 for details). In spite of these difficulties, there is a need for evaluation of some sort. We must make judgments about the merits of specific approaches and programs. Perhaps the best that can be done at the present is to use a variety of instruments, recognize their limitations, and attempt to make sense out of the pattern of results obtained. In general, evaluating the effectiveness of any approach to the teaching of thinking on the basis of a single instrument is not reasonable.

Review of Current Cognitive Education Programs

Do approaches and programs that have been developed to teach thinking in the classroom reflect current conceptualizations of thinking as previously analyzed, and do they resolve some of the issues previously discussed? To reveal the current state of the art in the field of cognitive education, different types of programs will be briefly described below following a breakdown utilized by Nickerson, Perkins, & Smith, (1985) (Appendix A provides more information on a variety of programs available).

Cognitive Operations Approach

These programs focus on the teaching of certain basic cognitive processes or skills that are assumed to be essential for, or components of, intellectual competence. They include programs such as:

Instrumental Enrichment (I.E.) Program (Feuerstein, Rand, Hoffman, & Miller, 1980)
The Structure of Intellect Program (SOI) (Meeker, M. & Meeker, R., 1969)
Science, A Process Approach (Gagné, 1967)
BASICS (Ehrenberg & Sydelle, 1980)
Project Intelligence (Odyssey) (Adams, et al., 1982; Nickerson, 1985).

It has been observed that cognitively oriented programs provide extensive practice using a diversity of tasks frequently found in testing/evaluation instruments. These programs can be criticized from two aspects (Nickerson, Perkins, & Smith, 1985). First, theoretical bases of the various programs are uncertain; there are many different lists of fundamental operations which seem to be endless and without adequate empirical basis. Second, these programs tend to neglect the teaching of very complex cognitive skills such as writing, or mathematical problem solving.

Heuristic Oriented Approach

This approach emphasizes certain explicit methods such as problem solving. The heuristic applies to a variety of cognitive tasks, and to teach these methods outside conventional subject-matter courses. They include programs such as:

Patterns of Problem Solving (Rubenstein, 1975)
Heuristic Instruction in Mathematical Problem-Solving (Schoenfeld, 1985)
A Practicum of Thinking (Wheeler & Dember, 1979)
The Productive Thinking Program (Covington, Crutchfield, Davies, & Olton, 1974)
The CoRT Program (de Bono, 1975)
Problem-based Self-Instruction in Medical Problem Solving (Barrows & Tambly,1980)
Intelligence Applied (Sternberg, 1986).
The IDEAL Problem Solver (Bransford & Stein, 1984).

Concerning this group of programs, it has been noted that it is difficult to write an algorithm that is guaranteed to work, especially for intellectually difficult tasks. The heuristic strategies may not be applicable to specific problems. Most of these programs require extensive external control, leaving little initiative for the learner. Furthermore, their effectiveness depends on sound strategies, careful student guidance, and concern for teaching for transfer. Since these conditions are not easily satisfied, the development of effective heuristic programs takes extensive preparation time. Though these programs may possess high face validity, there is no guarantee that these heuristics would be properly applied by the learner. Thus there are two main challenges in constructing heuristic-oriented programs, namely, "identifying really effective strategies and, getting people to use them in situations other than the instructional context" (Nickerson, Perkins, & Smith, 1985, pp. 226 & 227). In spite of these problems, the heuristic-oriented approach is considered superior to the cognitive-oriented approach which does not often break a task into sub-tasks.

Formal Thinking Approach

The objectives of these programs is to foster formal operational thinking in specific content area. Some of these programs are:

ADAPT (Accent on the Development of Abstract Process of Thought) (Carpenter, 1980)

DOORS (Development of Operational Reasoning Skills) (Schermerhorn, Williams, & Dickison, 1982)

COMPAS (Consortium for Operating and Managing Programs for the Advancement of Skills) (Schermerhorn, Williams, Dickison, & 1982)

SOAR (Stress on Analytical Reasoning) (Carmichael, Hassell, Hunter, Jones, Ryan, & Vincent, 1980)

DORIS (Development of Reasoning in Science) (Collea, & Nummedal, 1980).

It is difficult to say if such Piagetian-based programs are effective since quantitative data are sparse. However, qualitative data tend to be positive. This approach has two major advantages: it has encouraged teachers "to think hard about their teaching goals and methods...." (Nickerson, Perkins, & Smith, 1985, p. 245). As well, it has provided a useful framework for teachers in different disciplines to share ideas. Usually, any evaluation of this approach tends to be associated with the weaknesses of Piagetian theory in general (e.g., stages, invariant functions, cross-cultural issues, semi-clinical methods, etc) (Modgil & Modgil, 1982).

Thinking through Language and Symbol Manipulation

These are programs that emphasize symbol manipulation skills. Examples are:

Language in Thought and Action (Hayakwa, 1964)

Universe of Discourse (Minister of State for Development of Human Intelligence, 1980)

Modeling Inner Speech and Self-Instruction as a Means of Teaching Thinking (Meichenbaum, 1977)

LOGO and Procedural Thinking (Feuerzeig, et al., 1971).

Solid empirical data for evaluation are lacking with these programs. The single most advantageous feature is the emphasis on complex products, such as essays, stories, arguments, computer programs, etc. Also, this approach mirrors real-life situations and it is believed that there is the potential of knowledge of representation (symbols) transferring to other fields.

Thinking about Thinking

These programs "focus on thinking as subject matter" and stress mainly metacognition. They include programs such as:

S.P.E.L.T. (Strategies Program for Effective Learning/Thinking) (Mulcahy, Marfo, Peat & Andrews, 1987)
Philosophy for Children (Lipman, Sharp, & Oscanyan, 1980)
The Anatomy of Argument (Toulmins, Rieke, & Janik, 1979)
Metacognitive Skills (Brown & Campione, 1978)
The Complete Problem Solver (Hayes, 1981).

This approach avoids the pitfall "that teaching about something is necessarily an effective way to teach someone how to do it" (Nickerson, Perkins & Smith, 1985, p. 306). It does so by combining heuristic and language approaches; it encourages logical reasoning and provides cues and prompts. There is a natural link between "the metacognitive approach" and other approaches (may be complementary), which makes it flexible.

The above current cognitive education programs differ widely in terms of scope, logistics, skill development, age/grade suitability, instructional methodology, curriculum integration, and training requirements. Rather than reflecting the current conceptualizations of thinking, these program differences seem largely to be a product of the variation of theoretical points of the program developers. Their positions were influenced by the context (i.e., time period, prominent theories of mentors, etc.) in which they and their colleagues collaborated.

In spite of the lack of clear agreement between current theory and instructional practice., a growing number of schools and school districts are inclined to opt for the implementation of one of these programs though there is little empirical research available for evaluating them. As well, there is little solid evaluative data on the differential effectiveness of these programs available to the public to aid in making these important decisions. In the vast majority of cases, little if any attempt has been made to collect summative evaluation data to support a particular program. As Nickerson (1990) has pointed out, there are several reasons for this lack of evaluation data, among which are:

(a) many of the programs are relatively new with insufficient time to conduct extensive evaluations;
(b) evaluating the long-range effectiveness of any educational innovation is a complicated, expensive, and controversial undertaking;
(c) there is no consensus as to what can be taken as evidence of the success or failure of a particular approach.

Chapter Summary

This chapter began by analyzing the conceptual and empirical bases for teaching learning/thinking skills. The rationale for directly teaching thinking rested on demand: cognitive, economic and social benefits accruing to individuals and groups. Since the content of thinking, as manifested in different programs, varied and there was no consensus as to what constitutes thinking nor how to teach it, it may be practical to limit oneself to specific objectives and select programs that meet these objectives.

The inextricable relationship between learning, thinking and cognitive processes makes it imperative to provide more differentiated teaching and research. Such an approach takes person, context, and many more parameters into consideration in curriculum and research designs. For example, in research design, longitudinal studies using a factorial approach makes it possible to examine both main effects and interactions, so that the suitability of programs for specific diagnostic categories under different contexts may be verified. This differentiated approach also helps to link specific teacher and student behaviors to school-based achievement.

Central to the issues of cognitive education is strategy transfer or generalization, which is directly linked to what and how to teach, and measurement of program effectiveness. In this connection, provision of domain specific knowledge as well as control processes must be stressed and taught *in tandem.* As well, the tests or measuring instruments selected must not only be representative of the behaviors being examined but also be sensitive to program context (Nickerson, Perkins, & Smith, 1985; Savell, Twohig & Rachford, 1986). These new directions in research and education have become possible because of the increasing revelations in cognitive science, an interdisciplinary perspective, and their subsequent application to instructional practices.

On the whole, the issues discussed are relevant to cognitive education and to the design and implementation of evaluation studies. They may be summarized as:

- How best may we approach the teaching of thinking? Specifically, should we select an in-content approach or an out-of-content approach to the teaching of thinking?
- What important design considerations may be incorporated in our research?

We were guided by these issues in the design of the study. Several design considerations discussed earlier (e.g., longitudinal design using a factorial approach to examine the suitability of programs for specific diagnostic categories under different contexts; and valid and reliable test instruments to examine strategy generalization and program effectiveness) were incorporated in this study. Since the characteristics of experimental treatments must be clarified in the research design, the two programs selected for comparison in the study will be described in detail in the following chapter. The two programs are I.E. (out-of-content) and S.P.E.L.T. (in-content).

CHAPTER 3

THE TWO SELECTED PROGRAMS: I.E. AND S.P.E.L.T.

The Cognitive Education Project was established with the general purpose of undertaking a long-term evaluation of two cognitive education programs (out-of-content versus in-content) in relation to traditional instruction in elementary and junior high classrooms.

As stated in Chapter 1, Feuerstein's Instrumental Enrichment (hereafter, I.E.) (Feuerstein, Rand, Hoffman, & Miller, 1980) was selected to represent the out-of-content approach because it is one of the most comprehensive and field tested learning/thinking programs available to date. On the other hand, the Strategies Program for Effective Learning/Thinking (hereafter, S.P.E.L.T.) (Mulcahy, Marfo, & Peat, 1984; Mulcahy, Marfo, Peat, & Andrews, 1987) was selected as the in-content program because it integrates several prominent cognitive theories and intervention procedures [e.g.,Vygotsky (1962), Luria (1960), Brown (1980), Flavell (1977), Meichenbaum (1977), Deshler (Deshler, Alley, Warren, & Schumaker, 1980), and Bandura (1978)], and is unique in that it attempts to enhance students' learning/ thinking skills through student generated activities. Therefore, it was felt that S.P.E.L.T. would provide an important research comparison.

In the following sections, these two programs will be separately described in detail. Included are program characteristics, goals, teaching methodology, inservice training, and evaluation of the two programs.

Instrumental Enrichment (I.E.)

Instrumental Enrichment (Feuerstein, Rand, Hoffman, & Miller, 1980) was originally designed for culturally disadvantaged children and youth. The Instrumental Enrichment program (I.E.), however, is currently being used with a broader population of children in upper elementary, junior, and senior high schools. The program is based on Feuerstein's theory of structural cognitive modifiability via mediated learning experience. This theory suggests that cognitive deficiencies which youngsters exhibit as a result of impoverished experiential backgrounds can be corrected if a knowledgeable adult, usually a parent or teacher, intervenes between the child and his/her environment. Such mediation takes the form of intentional transformation, reordering, organizing, grouping, or framing of environmental stimuli in a way that transcends the immediate stimuli and reveals new meaning and insights hitherto unknown to the child. The program utilizes paper-and-pencil tasks and intensive teacher-student discussion.

Program Characteristics

A distinguishing feature of I.E. is its emphasis on the importance of **mediation** for strategy development. Strategies are ways to facilitate the acquisition, manipulation, integration, storage and retrieval of information across situations and settings (Alley & Deshler, 1979). Training for such strategy development, or more broadly for cognitive growth, may occur in one of two ways. One way of developing cognitive growth is through direct exposure to environmental stimuli while the second way is through a "mediated learning experience." Feuerstein supports a mediational approach (Feuerstein, Rand, Hoffman, & Miller, 1980). The importance of mediation for Feuerstein is not only with respect to the content that is learned, but also to the cognitive functions and patterns of motivation that emerge. Effective mediation sensitizes the child to procedures that transcend the particular events which are the focus of the instruction. Mastery of a problem situation requires that the child learn to cope with a sequence of events situated in time and space, to integrate and inter-relate stimuli, and to abstract information. At its most fundamental level, Vye (1983) has stated that a mediated learning experience is one that imparts basic strategies for operating on the environment. These strategies are the prerequisites for learning from direct experience.

For mediation to be effective, Feuerstein holds that it should follow four principles. These include:

a. **Intentionality** - Mediation must be purposeful and goal directed. The mediator selects the to-be-processed stimuli and directs the child's attention to certain objects or events. In the process the child is aided in noticing features other than the most perceptually salient.

b. **Competence** - Successful experiences demonstrated by the child are assumed to be reinforcing, thereby increasing the likelihood of their repeated occurrence.

c. **Transcendence** - In the process of solving the task at hand, the child acquires basic strategies for gathering and relating information.

d. **Meaning** - The purpose of the task is conveyed.

Thus in I.E., social interaction is important, in that it is not the content, but the *means of interacting* that is internalized by the child. An adult mediator elicits behaviors from the child that lead to the solving of the problem task. The child then comes to understand the goals and strategies of the task. Therefore, the sequence is response, followed by analysis, with the mediator providing only as much help to the child as is needed for him/her to come to newer understanding of the task. A great deal of emphasis is placed on the use of language in helping the child create new cognitive structural centres overcoming the natural structure of the sensory field.

The Feuerstein program consists of fifteen instruments containing pencil-and-paper exercises as follows: Organization of Dots; Analytic Perception; Orientation in Space I, II, III; Comparisons; Categorization; Instructions; Family Relations; Illustrations; Numerical Progressions; Temporal Relations; Stencil Design; Transitive Relations; and, Syllogisms. This program can be integrated into the regular school curriculum. Typically, it extends over a three-year period, with a minimum of three sessions per week devoted to work on the instruments. While the names of the individual instruments indicate the dimensions of the program, the program is intended to be content-free.

Goals

The term content-free is intended to convey that the contents of any particular exercise are merely a vehicle, or an instrument, to achieve the overall goals of the program. The major goal of I.E. is to enhance the cognitive modifiability, that is, learning potential, of the individual. This is achieved by the implementation of the following six subgoals:

a. The correction of deficient cognitive functions;
b. the teaching of specific concepts, operations, and vocabulary required by the I.E. exercises;
c. the development of an intrinsic need for adequate cognitive functioning, and the spontaneous use of operational thinking by the production of crystallized schema and habit formation;
d. the production of insight and understanding of one's own thought processes, in particular, those processes that produce success as well as those that result in failure;
e. the production of task-intrinsic motivation that is reinforced by the meaning of the program in a broader social context; and

f. a change in orientation towards oneself from passive recipient and reproducer to active generator of information.

Although the achievement of all the subgoals of the program depends on an active interaction between the three elements of student, teacher, and instruments, subgoals (b) and (d) rely heavily on the teacher's contribution. The remaining subgoals are achieved by the nature of the instruments themselves with the exception of the last subgoal, which is a product of all the others together.

Feuerstein, Rand, Hoffman, & Miller (1980) have claimed that I.E. is effective in increasing school achievement, social skills, intellectual skills and motivation to learn. Studies reported by Feuerstein, Rand, and Hoffman (1979) and others (Savell, Twohig, & Rockford, 1986; Shaver & Beasley, 1987) tend to support a general conclusion that I.E. is effective for increasing learning. As of yet, it has not been put to the empirical test of a comprehensive long-term evaluation utilizing both age and diagnostic groups as independent variables.

A typical lesson in I.E., as developed by Feuerstein, **appears** to be highly perceptual with strong visual-motor factors; however, in reality, the product resulting from, say, the connecting of dots to form a pattern in the Organization of Dots instrument, is a very minor part of I.E. The program is characterized by the students discovering a pattern in the instruments through mediation; determining the underlying principle, then "bridging" this principle to other examples. It is this dynamic involvement of the teacher in a dialogue with the student, along with the change in orientation from product to process that describes this program. Timing for the student should involve a minimum of 120 minutes of instruction per week over two academic years.

Teaching Methodology

The teaching methodology of I.E. follows the following principles:

1. **The Development of Representational Thought**
   Implicit in the design and classroom use of I.E. materials is the adherence to an active modification approach to children; that by using I.E. materials coupled with effective teaching skills, attempts are made to create the optimal conditions for inducing positive cognitive changes within students. During the workshop, an attitude was fostered which stated that all children are able to change cognitively,

regardless of age, and are capable of reaching the level of abstract and representational thinking (Feuerstein, Rand, Hoffman, & Miller, 1980).

2. **Knowledge of Cognitive Deficiencies or Efficiencies**

Feuerstein's Theory of Cognitive Modifiability follows an Information Processing Model of Input, Elaboration, and Output. Poor or inadequately mediated learning experiences lead to cognitive deficiencies related to the three phases of information processing. Feuerstein has described as many as 28 deficiencies, including impulsivity, lack of regard for precision and accuracy, unplanned and unsystematic exploratory behavior, inability to recognize and define problems, failure to make comparisons spontaneously, etc (Mulcahy, Andrews, & Peat, 1991). Knowledge of these deficient functions is intended to give teachers a labelling set for the thinking process and thereby to facilitate analysis of students' thinking. This analysis allows teachers to direct questions and/or specify praise in order to arouse a need and/or to develop competency in the students for particular thinking functions or set of functions (Pace, 1984).

3. **Having a Transcendent Focus**

Transcendent focus is teaching for tomorrow. It is the use of questions as a way to repeat key concepts particularly to facilitate the transfer of strategies or concepts taught in the I.E. lessons (i.e., What other ways could we have done this? In what other situation could we use this?) and to raise students' metacognitive awareness (i.e., How did you figure that out? Do you know what thinking skill you just used really well?). "Bridging" is the I.E. term used for this concept and refers to helping "students to see connections that are severed so cleanly by subject focus" (Pace, 1984).

4. **Developing a Feeling of Competence**

Teachers were encouraged to develop a feeling of competence in their students by:

a. ensuring success by choosing tasks of appropriate difficulty,

b. leading students to discover answers for themselves, then praising the discovery, and,

c. using specific praise to reinforce a positive use of cognitive functions.

This feeling of competence is seen as a motivational factor in that when students view themselves as competent they are willing to try new tasks (Pace, 1984).

5. **Modelling Rather Than Demonstrating**

The didactics of teaching I.E. is modelling rather than demonstrating. Demonstrating is what teachers normally do in front of a class, that is, they usually show a process only when its results are as ordered: the chemicals react properly; the spelling is correct; the math problem is solved. This is contrasted to modelling which is "talking through" the process, including false starts, blind alleys, and dealing with errors. It requires that teachers express their thinking processes out loud in order for students to gain insight into how the processes are carried out (Pace, 1984).

Inservice Training

Inservice for teachers in the Instrumental Enrichment Program (Feuerstein, Rand, Hoffman, & Miller, 1980) was presented in two parts; Part I, a three-day session in September, 1984, Part II a two-day session three weeks later. Classroom implementation of I.E. began immediately following Part I of the inservice. Unlike S.P.E.L.T., I.E. is divided into three levels, each level corresponding to approximately one year of instruction. In 1985, Level 1 training involved sixteen teachers, for Level 2, 35. The instructors for these sessions were certified I.E. trainers and followed the standard for inservice training as required by the authors/distributors of the I.E. materials.

For Level 1, four instruments (sets of pencil-and-paper exercises, both verbal and non-verbal) were introduced in the following sequence:

a. Organization of Dots
b. Orientation in Space 1
c. Comparisons, and
d. Analytical Perception

For Level 2, six instruments were covered during the workshop as follows:

a. Classifications
b. Numerical Progressions
c. Illustrations (Cartoons)
d. Instructions
e. Temporal Relations
f. Family Relations

As can be seen from the above, two years of I.E. training enable teachers to use the first ten instruments in their classroom instruction.

The purpose of the I.E. training workshop was to enable the teachers not only to implement, but also to understand the theory and underlying goals of the program as previously described.

During the intensive training sessions, the teachers were guided through examples of the I.E. materials in order to familiarize them with the various "instruments" they were expected to use in their classrooms following the training and, more importantly, to gain an understanding of underlying sequences and processes of basic thinking skills. The "content-free" materials were presented as a means of showing students techniques and processes of thinking. The interaction between teacher and student (**mediation**) was underlined as most important, not the worksheets themselves, with the intent that students would understand and proficiently use similar thinking skills for many different activities. Teachers were instructed in the five aspects of the program as listed in the teaching methodology section.

Program Evaluation

Savell, Twohig, and Rachford (1986) have reviewed the empirical status of I.E. as a method of teaching thinking skills. These authors note that unlike most other programs, I.E. has many empirical studies. They reviewed a wide range of empirical studies based in Israel, Venezuela, Canada, and the United States. The results of these studies were examined in two major dimensions. First, the authors looked into the nature and statistical significance of I.E. effects, and for those effects that were statistically significant. Secondly, they examined the number of I.E. effects that appeared to be required for these effects to appear.

The authors concluded that "many of the studies failed to find clear I.E. effects", and as well, most of the studies were difficult to interpret, owing to methodological problems, namely, "weakness of the experimental intervention, conflicting outcomes on different measures, inadequacies of experimental control, (and) insufficiencies in the information provided"(p. 401). In spite of these methodological problems and skepticism as to the results of the studies, Savell, Twohig, and Rachford (1986) made some humble generalizations and conclusions about the I.E. effects, that:

a. the I.E. program has variable impact on different populations, diagnostic categories, in different SES, in different countries;

b. these I.E. effects are demonstrable mainly in "certain standard non-verbal measures of intelligence", but not in affective-motivational areas such as self-esteem, and locus of control;

c. some prerequisites for effectiveness appear to be necessary for the program's effectiveness, namely, "at least a week of training for FIE (Feuerstein's Instrumental Enrichment) instructors; generally 80 hours or more of student exposure to FIE over a one- or two-year period; and FIE taught in conjunction with some other subject matter of interest and importance to the student" (p. 402).

Shaver and Beasley (1987) have noted some problems with the fact that the I.E. program is copyrighted. There is the tendency for I.E. to be "(a) fossilized in its present form, and (b) of only reaching a tiny proportion of those whose professional skills might be affected by it" (p. 117). To offset this tendency to 'mystify' the program, three suggestions were offered by the authors as follows:

> (1) Mediated Learning and its accompanying meta-cognitive model be treated by psychologists just as any other theoretical model to be tested, developed and allowed to modify and be modified by the existing body of intervention theory;
>
> (2) other 'content-free' learning materials be generated by those concerned with remedial education, free of copyright, so that the professional skills underlying I.E. can be clarified;
>
> (3) the principles underlying the practice of I.E. be applied to school subject teaching. The original idea of choosing content-free materials to avoid I.E. being associated with pupils' previous experiences of failure be relaxed. This would allow, for example, the content and concepts of differing academic subject areas to serve as vehicles for the various parameters of the Feuerstein model" (Shaver & Beasley, 1987, p. 117).

Because of the methodological problems involved in interpretation of different empirical studies on the I.E., the authors exhort future researchers in this area to seek to provide answers to questions such as age effects, variable populations, why measures of self-esteem (affective) failed to show I.E. effects; how much instruction is needed to produce effect; how much inservice training for teachers; how one relates I.E. to curriculum (bridging the gap between strategy instruction and curriculum); what is the best way of measuring I.E. effects; and, how large an effect is reasonable.

Savell, Twohig, and Rachford (1986) have suggested a number of things to improve I.E. studies from which other instructional researchers can benefit (See Table 1 for a summary description). These suggestions for improvement in instructional research in general, and I.E. in particular cover areas such as goals, diagnostic category, inservicing, implementing according to plan, devising appropriate tests and putting together a battery of tests, research design and statistical analysis, and background information concerning implementation. These suggestions while ideal, are not easy to comply with, a problem that is related to quasi-experimental studies in general (Keppel, 1981; Kerlinger, 1973). As pointed out by Nickerson, Perkins, and Smith (1985), these problems include:

> Incompatibility with respect to control group treatments, differences in the beginning ability of students or in the quality of teaching, differences in the classroom situation and in the degree of control over extraneous variables, differences in the duration of the evaluation experiment, etc. (p. 315).

As well, subject attrition poses problems in terms of the generalizability of one's findings over the course of three years. The table below shows some of the factors that may be taken into consideration in designing evaluation activities to improve the effectiveness of programs.

Table 1

Suggestions for improving program research

1. Specify the goals of the research, the questions the research is intended to answer.
2. Select a subject population similar to the one in which the program can be expected to work.
3. Select dependent variables that adequately reflect the goals of the program and that can be expected to show intervention effects.
4. Construct/select measures that are capable of providing information about the specified variables, and say how they relate to each other and to the tests used in the program.
5. Determine the administrative feasibility of the study and the trade-offs involved.
6. Provide maximum possible instruction of the program (maximum number of hours and instruments).
7. Provide the recommended amount of training for program instructors before the start of the first year and each succeeding year.
8. Provide the recommended amount of support for program instructors.
9. Randomly assign experimental units (e.g. individuals, classes).

10. Select a suitable set of teachers.
11. Provide statistics on changes in group composition (gains and losses) in the experimental and control groups over time and show what effect, if any, these changes have on the interpretation of the results.
12. Structure instructions in a way that maximizes the possibility of bridging.
13. Formulate design and procedures for following up the experimental and control subjects after the intervention has ended so that data can be obtained on the program's snowballing hypothesis (Feuerstein's).
14. Provide descriptive statistics for the effects investigated; if classes were used as experimental units, provide information about degrees of freedom and choice of error term.
15. Provide information about the completeness of implementation.
16. Control and/or provide information concerning naturally occurring sources of experimental error (e.g. pre-training differences between instructors assigned to experimental and control groups.

(Savell, Twohig, & Rachford, 1986; adapted from Darko-Yeboah, 1989)

Strategies Program for Effective Learning/Thinking (S.P.E.L.T.)

The Strategies Program for Effective Learning/Thinking (S.P.E.L.T.) (Mulcahy, Marfo, Peat, & Andrews, 1987) translates aspects of contemporary cognitive psychological theory and research into a practical and easy-to-implement instructional program which seeks to train children to become active and purposeful learners, thinkers and problem solvers. Cognitive strategies are conceptualized as internally organized skills or control processes by which learners regulate their cognitive and/or learning behavior. A learner's repertoire of strategies is thus seen as a set of tools that enables him/her to more effectively and efficiently activate and regulate important cognitive activities such as attention, comprehension, retention and retrieval of information, thinking and problem solving. The teacher plays the role of a mediator between the learner and the external world, structuring the learning environment and providing opportunities necessary to establish and improve strategic behavior in learning, thinking, and problem-solving situations.

A general teaching orientation is embedded within S.P.E.L.T. whereby the teacher's goal in all planning and instruction is to actively involve the student in the learning process. The principal hallmarks of this orientation include:

1. the raising of students' awareness about their own cognitive processes,
2. how to control one's cognitive activities,
3. the leading of students towards discovery and deduction rather than revealing or teaching facts to them, and,
4. the constant challenging of the students to be critical, systematic, evaluative and strategic in their behavior and attitude to learning, thinking and problem solving.

S.P.E.L.T. aims to teach specific cognitive strategies, both recommended and teacher generated, and to guide the students toward their own control and generation of learning/thinking strategies (see Figure 1).

Program Characteristics

S.P.E.L.T. (Mulcahy, Marfo, & Peat, 1984) was initially aimed at children in the upper elementary and junior high school grades. It has since been extended to high school and college populations (Mulcahy, Marfo, Peat, & Andrews, 1987). The focus on high school and college students by many existing learning strategy programs (known as developmental education programs in certain circles in the United States) is perhaps an indication that it is easier to work with older students when developing innovative programs. However, in both theoretical and practical terms, it makes sense that potentially valuable interventions be instituted as early in the child's school life as possible. In fact, there is compelling empirical evidence to support learning/thinking strategies instructional programs in the early grades. Research has indicated that one qualitative difference between adult and younger children lies in the fact that unlike older children and adults, younger children fail to spontaneously utilize techniques, procedures, or strategies that facilitate learning and problem solving. This difference between older and younger children appears to be true also of comparisons involving intellectually high and low functioning children (Paris & Lindaeur, 1982). We have learned from this line of research too, that it is possible, through a systematic program of instruction, to train young or intellectually low-functioning children to be strategic in their learning and thinking behavior.

Figure 1 - S.P.E.L.T Instructional Model

Continuum

Phase I

Goals:

Metacognitive Empowerment:

a) Raise Student's awareness that strategies exist

b) Illustrate that the systematic use of strategies improves learning.

c) Increase of active involvement and interaction in the learning process.

Phase II

Goals:

Students will:

a) maintain strategy use (as developed in Phase I).

b) be able to evaluate present strategy use.

c) modify/extend strategies taught to different settings, situations.

d) be actively involved in the learning process.

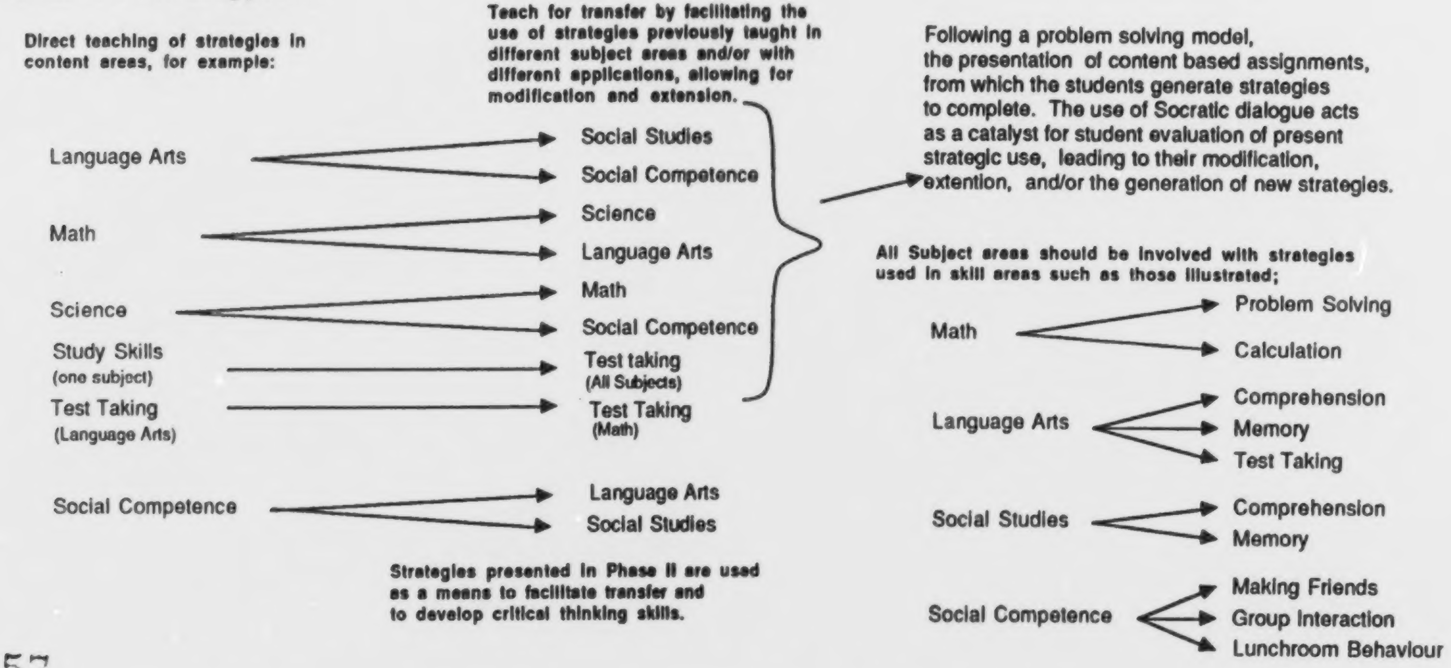
Phase III

Goals:

Students will:

a) monitor, evaluate, and generate effective and efficient strategies to improve learning.

b) be actively involved in the learning process.



Direct teaching of strategies in content areas, for example:

Teach for transfer by facilitating the use of strategies previously taught in different subject areas and/or with different applications, allowing for modification and extension.

Following a problem solving model, the presentation of content based assignments, from which the students generate strategies to complete. The use of Socratic dialogue acts as a catalyst for student evaluation of present strategic use, leading to their modification, extention, and/or the generation of new strategies.

All Subject areas should be involved with strategies used in skill areas such as those illustrated;

Strategies presented in Phase II are used as a means to facilitate transfer and to develop critical thinking skills.

Language Arts
Social Studies
Social Competence
Math
Science
Language Arts
Science
Math
Social Competence
Study Skills (one subject)
Test taking (All Subjects)
Test Taking (Language Arts)
Test Taking (Math)
Social Competence
Language Arts
Social Studies
Math
Problem Solving
Calculation
Language Arts
Comprehension
Memory
Test Taking
Social Studies
Comprehension
Memory
Social Competence
Making Friends
Group Interaction
Lunchroom Behaviour

Another area where S.P.E.L.T. differs from other learning/thinking strategies programs is the instructional context. As previously described, many cognitive education programs have been designed as structured packages to be taught independently of existing curriculum content or subject matter. In contrast, an important philosophy underlying the S.P.E.L.T. approach is that the teaching of learning/thinking strategies should take place within content and not as an independent or isolated curricular activity. One of the dangers of independently taught, non-content programs is that they seem to reinforce the perception by students that there is a time for thinking and there is a time for other learning activities. Therefore, unless a special effort is made to train for generalization of skills taught in programs across different content areas, students will generally have difficulty applying such skills beyond the specific program activities. Unless a program leads to generalized effects of training, its utility is seriously compromised (Ellis, Lenz, & Sabornie, 1987).

S.P.E.L.T. differs from other programs in yet another way. S.P.E.L.T. is premised on the view that all categories of children--gifted, normally achieving, learning disabled, and mildly mentally handicapped--can benefit from strategy instruction. Instruction in learning strategies might best take place in the regular classroom where high-, medium-, and low-achieving students can benefit from the strategic behavior of one another. This is consistent with the movement toward mainstreaming of different categories of children.

Finally, S.P.E.L.T. targets three aspects of student performance: academic learning, thinking and problem solving, and social competence. Thinking and problem solving as well as social competence are two important domains of children's development that current educational practices fail to address adequately. The prominence in recent years of programs for teaching thinking reflect efforts to readdress the failure of schools to promote thinking skills. The teaching of social competence is emphasized even less than the teaching of thinking. With these concerns in mind, another distinguishing aspect of S.P.E.L.T. is its design to teach and nurture not only thinking and problem solving skills, but also social competence.

Goals

In broad terms, the goals of S.P.E.L.T. include training students to become:

1. active learners, thinkers and problem solvers;

2. more independent, planfull and strategically efficient in their approach to learning;
3. more aware of, and in better control of their own thinking processes (metacognitive development).

A progression from the lowest level of strategy acquisition (acquisition through teacher imposition-Phase I) to the highest level of acquisition (acquisition through self-generation-Phase III) is the goal of the S.P.E.L.T. instructional model continuum. Phase I teaching consists of the presentation of a number of recommended and teacher generated strategies designed to expose the students to the fact that cognitive strategies exist (metacognitive awareness) and to illustrate that organized, goal-directed and efficient use of learning strategies increases the students' ability to acquire, think about, remember, retrieve, express and apply information and ideas. As the students practice these strategies in the content areas, active involvement and interaction with the material to be learned is facilitated. The extended exposure to, and practice in, using these strategies begins the process of consciously building a personal repertoire of useful strategies for the students. These, in turn, serve as tools for learning new material (metacognitive empowerment). Phase I instruction can be viewed as the systematic establishment of students' strategic knowledge upon which Phase II and III teaching is based. During Phase I the source of control for strategy use is with the teacher. Remaining within this phase leaves little room for students to participate in the determination of which strategies are appropriate for what purposes, or for including previously developed personal strategies. This teacher-imposed approach is only the starting point of S.P.E.L.T. instruction; in fact, staying within this phase runs counter to the previously stated goals, namely, to facilitate active participation of the students in the learning process and to encourage students to become independent learners.

Students are encouraged from the outset to express their impressions and experiences as they use the strategies in order to begin the process of improving and/or modifying the strategies to suit their own unique needs and abilities. This becomes even more apparent as they become involved in Phase II teaching. During Phase II, strategies which were initially taught in one subject area are introduced in other subject areas, settings and/or situations. This process of adapting strategies to new applications inevitably leads to modification and/or extensions of the strategies taught in Phase I. Most strategies cannot be exactly duplicated as they are applied in varied settings, with different materials, and with differing assignment requirements. For example, a comprehension monitoring strategy first taught in language arts could then be used in social studies and afterwards be further modified to apply to the solving of a social interaction problem. The generated social interaction strategy, although still addressing comprehension monitoring, would take a considerably different form than the original language arts strategy; one emphasizes the comprehension of written material and the other addresses the monitoring of verbal interactions.

During Phase II, the students analyze the efficiency and effectiveness of their own strategy use based on previously taught strategies. This active use and modification facilitates transfer and/or the development of critical thinking skills. The control of the students' learning is gradually shifted from the teacher to the students as the students acquire the skills of critically analyzing and discussing their own strategy use, and then using this information to modify and/or extend the strategies taught in Phase I. Phase II can be thought of as a way of systematically teaching for transfer.

By the time the students are functioning in Phase III, they have acquired a large repertoire of learning strategies which they have found to be effective and useful. These strategies, supported by the metacognitive empowerment developed during the first two phases of instruction, serve as a knowledge base for further generation of strategies during Phase III instruction. During Phase III, content is presented to the students and tasks are assigned, but there is a minimal amount of teacher guidance given as to how they are to complete the task. Discussion centers around an analysis of how the task was completed or how it was approached by various students. An outcome of this discussion is the generation of a class-developed strategy or strategies used in completing the assignment. As in Phase II, the generated strategies in Phase III are then evaluated leading to further refinements and applications. The active involvement of the students in the learning process is maintained as a goal throughout all three phases of S.P.E.L.T. instruction.

Teaching Methodology

Because the strategies and goals described in Phase I of the S.P.E.L.T. program lend themselves to direct teaching, or teacher imposition (Derry & Murphy, 1986; Rigney, 1978), the Phase I instructional approach is teacher directed. The recommended methodology is a modification of the work of Deshler and Schumaker and their associates (Deshler, Warner, Schumaker, & Alley, 1983) at the Kansas University Institute for Research in Learning Disabilities (KU-IRLD). The S.P.E.L.T. program has been adapted to suit the instructional environment and needs of youngsters in the regular classroom as compared to its KU-IRLD application with learning disabled adolescents. Seven steps are involved in the instructional approach:

1. Motivation and Measurement Base,
2. Sell-Job,
3. Modelling,
4. Drill for Memorization,
5. Practice,
6. Feedback,
7. Post-Test.

These seven steps provide a structured approach that teachers can immediately apply to the classroom teaching of strategies during Phase I of the S.P.E.L.T. program. They are consistent with the teacher imposed model of instruction and allow the goals of Phase I to be quickly and efficiently reached. They take into account empirically proven motivational and instructional principles such as cognitive dissonance, advanced organizers, relating to the experiences of the children, modelling, over-learning, etc. However, as soon as the goals of Phase I are met, either for specific individual strategies and/or for strategy teaching in general, it is imperative to shift to the goals and methodology of Phase II.

The major emphasis of Phase II teaching is the systematic transfer of the strategic repertoire established in Phase I to a wide variety of situations, settings, and applications. As the students become more proficient in applying the strategies taught in Phase I, some begin to find that, using the exact strategy as imposed is somewhat ineffective or inefficient in some settings, or with different subject material than was initially presented in class. As the applications of the various strategies change, teachers are instructed to discuss the strategy adaptations, modifications and/or extensions, emphasizing how these changes improve strategy use. Students thus see that once a strategy is learned it is not "carved in stone," but can be modified. Specific strategies are also directly taught to students during this phase. These strategies act as tools enhancing the student's ability to systematically analyze the effectiveness and efficiency of their present repertoire of strategies. It is expected to lead to modifications, as students are able to generate ideas within different settings and situations where strategies might be necessary. Various authors addressing the issue of generalization have made similar recommendations, but these recommendations have not been incorporated within a comprehensive instructional model designed to ensure the generalization of learning/thinking strategies (Ellis, Lenz, & Clark, 1987; Meichenbaum, 1980; Stokes & Baer, 1977). The instructional approach within Phase

II personalizes the strategies and acts as a stepping stone in the students' ability to self-generate effective learning/thinking strategies, which is the goal of Phase III.

For both Phases II and III, teachers engage in **Socratic Dialogue**, an interactive relationship between teacher and students where the teacher leads the students through questioning to discover relationships for themselves. Socratic Dialogue as operationalized within S.P.E.L.T., is based upon the work of Collins (1977). It employs guidelines such as:

a. starting with what is known,
b. asking for multiple reasons,
c. asking for intermediate steps in the student's reasoning,
d. forming general rules from specific cases,
e. picking counter examples when insufficient reason is given,
f. using extreme case examples to illustrate a misapplication of what was stated,
g. probing for the differences between cases, and,
h. asking for a prediction.

Key teacher behaviors which are embedded in Socratic Dialogue are also employed. These include consciously using a 5-10 second wait-time, accepting and building upon students' responses, integrating students' responses to other information, extending students' ideas, clarifying students' responses, adding supplemental information, and not over-praising "correct" answers (French, 1983). These teacher behaviors allow for, and indeed, encourage precise use of vocabulary and clarity of expression. In fact, during discussion, if unclear communication is evident, the teacher's role is to facilitate clarity of responses before discussion continues. Socratic Dialogue is the chosen methodology for discussion revolving around the strategy use of students. It is believed that Socratic Dialogue can enhance the thinking skills of students during any classroom discussion regardless of content (Collins, 1977).

Phase III teaching continues to emphasize the use of Socratic Dialogue. The purpose of modifying and/or extending strategy use is to guide students to monitor, evaluate and generate effective strategies to aid their own acquisition, mediation and retrieval of the material to be learned. Unlike Phase I, learning in Phase III is largely student-controlled rather than teacher-controlled. A problem solving approach is used so that when content-based assignments are presented, students are assigned the responsibility of not only learning the material, but also determining how they will go about the learning process.

It was found that in order for teachers to understand the philosophy and methodology of S.P.E.L.T., as well as to comfortably implement the program, intensive inservice with follow-up is required. The following section provides a brief overview of the inservice training component.

Inservice Training

During the S.P.E.L.T. training process teachers were continually exposed to cognitive theory. Wasserman (1987) notes that, "the word theory has a bad reputation among educational practitioners" (p. 462). She further states that the attitude expressed in statements such as, "Don't give us that theory stuff. Give us something that works," is common (p. 462). We have found that this is indeed the initial reaction of the majority of teachers attending S.P.E.L.T. workshops, but that by the conclusion of their training they are able to perceive the theoretical backdrop of S.P.E.L.T. as a means of "anchoring their classroom practices on clear and well-researched ideas" (p. 462). This appears to be due to at least two factors interacting during the five days of workshop sessions. First, as they recognize some of the specific strategies or methodologies presented, they begin to see that some aspects of their past classroom teaching have emphasized the teaching of thinking skills, but that instruction in this area has usually been unconscious and/or incidental, lacking precise goal or direction. This recognition aids in their conceptualizing "cognitive education," in spite of their anti-theory bias, as non-threatening and achievable in their classrooms. Secondly, during the workshop, the teachers themselves actively practice the strategies by being placed in the role of students as the presenter's instructional approach moves along the S.P.E.L.T. continuum. This model allows the teachers to experience firsthand the process that parallels that which their students will undergo as S.P.E.L.T. is implemented in their classrooms. Placing the teachers in the student's position also has the effect of concretely demonstrating that teachers too should continue to develop their thinking skills and, in that sense places them in the dual role of learner and teacher. It also serves to emphasize their responsibility as role models of systematic and strategic problem solvers (Sternberg, 1985).

Inservice for teachers in the S.P.E.L.T. Program (Mulcahy, Marfo, Peat, & Andrews, 1987) was presented in two parts; Part I being a three-day session, Part II a two-day session held three weeks later. Classroom implementation of the S.P.E.L.T. program began immediately following Part I of the inservice. The approximately three-week time period between training sessions allowed the teachers to initiate implementation and to further familiarize themselves with the program, knowing that these experiences would be used as a basis for discussion, planning and expansion during the second part of their training.

Part I of the inservice involved introducing teachers to both the underlying theoretical model of S.P.E.L.T. and its practical application to classroom practice. This was accomplished by exposing them to, demonstrating, and having them practice a number of specific and generic strategies contained in the S.P.E.L.T. inservice Manual. Sequentially, they encountered each of the three phases of the S.P.E.L.T. Instructional Model by interactively completing a series of activities at each phase, culminating in their operating within Phase III (self-generation of strategies) on the third day of Part I training. This mode of presentation represented an attempt to model both the methodology and the strategies which the teachers were expected to emulate upon returning to their classrooms. The intent of this first part of the S.P.E.L.T. training was to provide teachers with the necessary structure enabling them to begin systematically implementing strategy teaching in their classrooms.

Part II was a two-day session designed to reinforce the initial three days, with a continued emphasis upon practical ways to enable students to reach the Phase III stage of self-generation of learning/thinking strategies as a systematic approach to their content material. Teachers were encouraged to describe their experiences during the preceding three weeks as they had attempted to begin S.P.E.L.T. implementation. Ideas were presented, and lessons modeled by teachers themselves. Using the new information thus obtained, and working in groups, teachers designed strategy teaching lesson plans using the S.P.E.L.T. model.

Program Evaluation

According to a recent observation (Darko-Yeboah, 1989), S.P.E.L.T. is still in its developmental phase. Few studies have been completed to demonstrate the effectiveness of S.P.E.L.T. Nevertheless, its increasing popularity has become apparent in the numerous local, national, and international invitations to workshops, inservices, book-chapter reviews, etc. (See Appendix L). Presently, a number of satellite sites are being contemplated or have been developed to test the program's effectiveness and cross-cultural significance i.e., in South Korea, Ghana and Australia. One system-wide implementation of the S.P.E.L.T. program has already been completed (Mulcahy, Peat, &

Darko-Yeboah, 1986) and a number of others are under consideration. Meanwhile, a number of graduate research studies (doctoral dissertations and masters theses) are underway using the S.P.E.L.T. program as their training study program.

Chapter Summary

In this chapter, I.E. and S.P.E.L.T. were described separately under five dimensions: program characteristics, goals, teaching methodology, inservice training, and program evaluation.

First, with respect to program characteristics, the critical factor for distinguishing between the two cognitive education programs is the nature of integration of the program into the curriculum. I.E. is considered a detached program because it is first taught without using curriculum content and later integrated into the curriculum. In contrast, S.P.E.L.T. is described as an embedded program because it is taught directly using curriculum content.

Secondly, in terms of goals, both I.E. and S.P.E.L.T. are directed towards making students active learners and efficient problem solvers. However, the I.E. is used to identify and correct deficient cognitive functions while the S.P.E.L.T. program is used as a basis to encourage students to generate their own strategies.

In terms of teaching methodology, both programs emphasize the importance of the social interactions between the teacher and the student. I.E. is based on 15 paper-pencil instruments which follow hourly lessons: three to five times/week for two to three years. It normally begins with a 10-minute introduction, followed by individual work, class discussion and summary. The teacher ensures that adequate mediational experiences are provided to students especially in the introductory and discussion stages. In S.P.E.L.T., the teacher uses specific strategies to activate and regulate students' cognitive activities and stresses internal mediation rather than external regulation and makes use of mediational teaching (Socratic Dialogue). Moreover, S.P.E.L.T. uses a three-phase instructional perspective i.e., (1) teacher-controlled strategy instruction; (2) the development of student ability to evaluate, modify, and extend present strategies; and (3) students monitor and generate their own strategies.

Inservice training in both programs consists of two parts, with an interval of a few weeks between the two parts for teachers to initiate implementation and prepare for further discussions in the later part of training. Unlike S.P.E.L.T., I.E. offers inservice training in three levels, each level corresponding to approximately one year of instruction.

Finally, with respect to program evaluation, while reports from many empirical studies shows that I.E. has variable impact on different populations, S.P.E.L.T. is still in its initial phase and its effectiveness has to be tested.

In short, despite somewhat different theoretical orientations, the common goal of the two programs is to ultimately help students learn 'how to learn' and thus become independent, organized, active, and purposeful thinkers and problem solvers. The major difference between the two programs is the out-of-content approach of I.E. versus the in-content approach of S.P.E.L.T.

With the rationale and issues discussed in the previous chapter and the two programs described in this chapter, we are thus led to ask: In what way will these two programs be compared and how can their effectiveness be tested? The methodology of the study is described in part two.

PART TWO - METHODOLOGY

Part Two is divided into three chapters. The research design, program implementation, and subject identification are described in chapter 4. The test instruments used in the study are specified in chapter 5, and pre-test analyses using these instruments are reported in chapter 6.

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CHAPTER 4

RESEARCH DESIGN, PROGRAM IMPLEMENTATION, AND SUBJECT IDENTIFICATION

This chapter describes the method of the research. Included are a brief overview of the overall investigation, a description of the research design, administrative procedures prior to program implementation, details of the implementation of the instructional conditions, and characteristics of the selected subjects.

Overview of the Study

The study was a long-term evaluation of two cognitive education programs (I.E. and S.P.E.L.T., as described in Chapter 3) in relation to traditional instruction for three types of students (gifted, average, and learning disabled) in upper elementary and junior high schools.

Volunteering teachers assigned to the control condition (traditional instruction) were told to teach as usual, whereas teachers assigned to the two cognitive education programs received inservice training from project staff prior to giving strategy instruction. Students in the control condition received traditional instruction, while students involved in the two cognitive education programs received a minimum of 120 minutes of strategy instruction per week over two school years.

Due to budget restraints the study was conducted in two major phases. Phase 1 began in October 1984. At grade 4, there were three types of instructional conditions: I.E., S.P.E.L.T., and traditional. Figure 2 depicts the general design of the study.

Figure 2: Overall Study Design

	Oct 84	June 85	Oct 85	June 86	June 87	June 88
Phase 1:						
Grade 4						
All*	PRE	PT1	- -	PT2	Maintenance	- -
Grade 7						
I.E.	PRE	PT1	- -	PT2	Maintenance	- -
CONTROL	PRE	PT1	- -	PT2	Maintenance	- -
Phase 2:						
Grade 4						
I.E.			PRE	PT1	PT2	Maintenance
S.P.E.L.T			PRE	PT1	PT2	Maintenance
Grade 7						
All*			PRE	PT1	PT2	Maintenance

*All refers to all 3 instructional conditions.

At grade 7, only two types of instructional conditions were implemented: I.E. and traditional. S.P.E.L.T. at grade 7 was not implemented until Phase 2 in the fall of 1985. Phase 2 began in October 1985, with some new subjects in S.P.E.L.T. and I.E. at grade 4 and new subjects in I.E., S.P.E.L.T. and traditional instruction at grade 7. This was done to increase the number of subjects for final analyses at the end of the project.

Research Design

Prior to strategy instruction, all participating students were pre-tested in October and November, year 1 and then post-tested each May-June period thereafter over three years. At pre-test approximately 4,000 students total were screened for possible inclusion in the three diagnostic categories (gifted, average, and learning disabled) for both Phases 1 and 2.

Thus, the research design basically was a pre-test/post-test factorial one. The three types of instructional programs (I.E., S.P.E.L.T., and Control) and the three groups of youngsters (gifted, average, and learning disabled) were the major parameters for evaluation for three successive years (i.e., at grades 4, 5, 6 and 7, 8, 9).

The group tests (i.e., Canadian Achievement test, self-concept, locus of control, and perceived competence) were administered by teachers at pre-test and post-test points. The individual strategy assessments in reading and math were administered by the project team during post-test points. The strategy assessments were not available for administration at pre-test. They were administered only at post-test points as at that time random assignments of classes to instructional conditions had been possible in approximately 80% of the cases. Therefore, a post-test only analysis was appropriate here (Glass & Hopkins, 1984).

Administrative Procedures Prior to Program Implementation

To obtain school teacher participation, an information package was prepared and distributed to school jurisdictions in Zones 2, 3 and 4 of North Central Alberta. This package consisted of an executive summary and detailed information. The executive summary provided an overall description of the project and summarized the respective roles of school jurisdictions, teachers and the project team.

Initially, superintendents were contacted by telephone and informed about the project. A more detailed information package was then sent to jurisdictions interested in the project. Members of the project team also met with the personnel of several school districts. Because of logistics (time constraints, finances, the large geographical area) some superintendents were contacted by telephone and the information packages were then mailed to them. Further follow-up phone calls and personal contacts where required were then made.

A liaison person from each board office contacted principals and teachers to ascertain their interest in the project and provided the research team with the names of interested teachers and schools. Some districts asked to meet with personnel during September 1984, to determine if they wished to be included in the study.

Teachers were requested to volunteer to any of the three instruction conditions (I.E., S.P.E.L.T., Control). The research team was then able to randomly assign approximately 80% of the teachers to the three conditions. The remaining teachers, because of budget constraints on the part of school jurisdictions, were assigned to the control group.

Program Implementation

The two cognitive education programs have been extensively described in the previous chapter and will not be repeated here. In this section, the implementation phase of the three instructional conditions is reported.

Teacher Background

Teachers involved in the project were requested to complete a questionnaire providing information with respect to their teaching background (see Appendix B for questionnaire). Respondents were 53% women and 47% men. Their ages ranged from 20 to 56 years with the control group being slightly older and more experienced. The mean age range was 38 years for control while S.P.E.L.T. and I.E. teachers were 35 - 36 years. The median number of years of experience was 15 for the control group and 11 for S.P.E.L.T. and I.E. Fourteen percent of the control, 26 % of S.P.E.L.T. and 29% of the I.E. groups had received inservice training in computers, psychology or behavior management prior to project involvement. Very few of the teachers had knowledge of cognitive education programs such as de Bono's CoRT program, Deshler's strategies or Feuerstein's I.E. program (5% for control group, 5% for S.P.E.L.T., and 9% for I.E.). Twenty-five percent of S.P.E.L.T. and I.E. teachers had been involved in some strategy training procedures while 10% of the control teachers had done so. That the teachers in the control group were slightly older and more experienced could be a factor when comparing this group to I.E. and S.P.E.L.T. The teachers volunteering in the project did have a variety of educational experiences but their experiential bases of cognitive education programs were similar. Therefore, teacher background differences should not be a significant factor between experimental (I.E. and S.P.E.L.T.) and the traditional instruction (control) group.

Inservice Training

In Phase 1 (1984), the inservice training for Instrumental Enrichment was conducted in late November for five full days. One session was held in Edmonton for 25 teachers in Edmonton and the surrounding districts south and east. Another session was held in Westlock for 22 teachers in the northern and western parts of the province. All inservice sessions were conducted by certified Instrumental Enrichment trainers brought in to conduct training. Classroom sets of materials were distributed to teachers at the close of inservice training. Based upon experience and in consultation with trainers, the Phase 2 (1985) inservice session was divided into two parts. Part one was a three-day session held in early October 1985 in Edmonton and part two was a two-day session held three weeks later. This allowed time for teachers to experiment with the program and then return to discuss any difficulties that were encountered and receive further training.

In Phase 1 (1984), inservice training for S.P.E.L.T. consisted of three separate sessions. Session one involved a two-day inservice session in late November followed by one full-day session in late January and a two-day session in February. This allowed for initial implementation to begin in January 1985, and 30 teachers were involved. In Phase 2, based on the evaluation of Phase 1, the inservice was held in two parts. Part one was a three-day session held in early October and part two, a two-day session held at the end of October. Classroom implementation began immediately after part two. Part two involved teachers from part one as well as teachers from year one who had been implementing the program for one year. Forty teachers were involved in Phase 2 and 15 in Phase 1.

Implementation Procedures

Teachers implemented the two experimental programs, S.P.E.L.T. and I.E., providing the required minimum of three 40-minute periods per week of instruction.

Phase 1 teachers were inserviced in either I.E. or S.P.E.L.T. during October and November 1984, and implemented the programs from January to June 1985. Strategy instruction continued into the 1985-86 school year and was withdrawn during the 1986-87 school year for a year of maintenance.

Phase 2 teachers began cognitive program instruction in December 1985/ January 1986 and continued until June 1986. Strategy instruction continued into the 1986-87 school year and was withdrawn during the 1987-88 school year for one year of maintenance.

As I.E. is an out-of-content program, teachers from Phases I and 2 were required to take time out of the curriculum to implement the program. While the time allocated was left to the discretion of teachers and administrators, the project research team provided suggestions. The amount of time allocated to I.E. varied from the minimum required time of three 40-minute periods per week to the maximum of five 35-minute periods per week. The overall mean time allocated for the program was 150 minutes.

In the elementary schools, as the teachers involved taught all subject areas, the I.E. instructional time was taken from a variety of content areas (e.g., language arts, math, and science, (see Table 2).

Table 2

Percentage of instructional time allocated for I.E.: grade 4

Subject areas	Phase 1	Phase 2
Language arts	58%	40%
Mathematics	8%	
No specific subject area	16%	60%

The greatest difficulty in implementing the program was at the junior high school level as the teachers involved taught one or two particular subjects only. The time was taken from a variety of subject areas, including language arts, mathematics, science, and social studies (see Table 3). Of these subjects teachers identified, 35% in Phase 1 and 25% in Phase 2 were across more than one subject. Bridging at the junior high school level therefore occurred in the content area of the subject periods distributed for I.E. instruction and to social and home situations.

Table 3

Percentage of instructional time allocated for I.E.: grade 7

Subject areas	Phase 1	Phase 2
Language arts	67%	50%
Mathematics	11%	
Science	22%	
Social Studies	44%	50%

During Phases 1 and 2 the elementary teachers taught S.P.E.L.T. the minimum three 40-minute periods per week but in many cases teachers taught the strategies and approaches across content areas. Language arts was the major content medium for S.P.E.L.T. instruction. Teachers also incorporated S.P.E.L.T. in mathematics, science and social studies (see Table 4). Of these subject areas identified, S.P.E.L.T. was incorporated in more than one subject, 89% of the cases in Phase 1 and 75% of the cases in Phase 2. Some teachers found that strategy instruction became an inherent part of their instruction as they progressed through the program.

Table 4

Percentage of instructional time allocated for S.P.E.L.T.: grade 4

Subject area	Phase 1	Phase 2
Language arts	78%	75%
Mathematics	44%	50%
Science	33%	38%
Social Studies	33%	25%

At the junior high level, as in the case of I.E., the S.P.E.L.T. teachers taught one or two subjects only. Language arts again was the major content medium for S.P.E.L.T. instruction (see Table 5).

Table 5

Percentage of instructional time allocated for S.P.E.L.T.: grade 7

Subject areas	Phase 1	Phase 2
Language arts	N/A	50%
Mathematics	N/A	13%
Science	N/A	37%
Social Studies	N/A	37%

As the project required two years of instruction, in essence teachers taught for one and a half years. Phase 1 teachers taught I.E. or S.P.E.L.T. from December 1984/January 1985 to June 1986, and phase 2 teachers taught the programs from December 1985/January 1986 to June 1987. Overall, approximately 120 hours were devoted to instruction. Wherever possible the same teachers were requested to follow the identified students for the two successive academic years. For instance, a grade 4 teacher would continue teaching the identified students in grade 5. In a fair proportion of cases in the elementary school this did happen (see Table 6).

Table 6

Percentage of teachers who followed identified students for 2 years

	Grade 4		Grade 7	
	I.E.	S.P.E.L.T.	I.E.	S.P.E.L.T.
Phase 1	22%	22%	34%	N/A
Phase 2	67%	25%	25%	24%

The project team also requested that the identified students be placed in one class for instruction in year 2 of instruction to facilitate continuous instruction. Therefore fewer teachers were involved in year 2 in each phase. In the cases where teachers could not follow the identified students for the two academic years, new teachers came into the project. These teachers were identified early so that inservice training could take place. Teachers receiving I.E. training were given both Level 1 and 2 in order to teach the second year of the program.

As some teachers who had taught in Phase 1 were requested that, wherever possible, they implement the program for Phase 2, some teachers had two years of experience in teaching the program (see Table 7).

Table 7

Teachers with two years of teaching the Cognitive Education Programs

	I.E.	S.P.E.L.T.
Grade 4	15%	26%
Grade 7	15%	N/A

In the case of new students who had no prior strategy instruction background, I.E. certified trainers identified the major elements of I.E. that would provide students with enough background knowledge to "cope" with Level 1 and 2 materials. As S.P.E.L.T. does not have the gradation of moving from Level 1 to Level 2 as in I.E., students were instructed in the program to work with peers on strategy development and this did not create any difficulty.

In I.E., students were required to follow through Level 1 and 2. All I.E. teachers in the project completed Level 1. At Phase 1, 66% of the teachers at the elementary and junior high grades completed Level 2 with all teachers near completion of Level 2 at the end of Phase 2. The instruments that the majority of teachers completed were: Dots 2, Categorization Numerical Progressions, Family Relations and Cartoons.

Implementation Monitoring

The teaching responsibility of providing a minimum of three 40-minute periods of program instruction per week was outlined to teachers during training. Subsequent to inservicing, various mechanics were used to facilitate communication between the university and the field, and to ensure that both S.P.E.L.T. and I.E. were implemented as required in the various experimental classrooms. These procedures were:

a. school visits involving classroom observations and structured interviews,
b. rotational phone calls,
c. video-taping of lessons, and,
d. dissemination of information through periodic newsletters.

Between two to five visits per year were made to all teachers in experimental conditions (i.e., cognitive education programs). During visits, lessons were observed by project members using standard observation forms which detailed key components of the two programs. Discussion with the teachers focused on the observed lessons. Other concerns or ideas arising from the teachers' implementation such as future lesson plans, motivational concerns, and/or individual student responses to instruction, were also addressed at this time. The number of visits per teacher was determined by the financial constraints of the study, with those teachers perceived by the project team to require additional guidance receiving more. Extra visits in order to give needed support and/or to solve the identified problems, were scheduled for teachers for those who expressed or showed difficulty with scheduling the required number of periods, motivational/ behavioral concerns, and/or trouble with integrating subject matter with cognitive education teaching.

A structured interview using standard questions was carried out with each visit. Questions pertaining to the effects of cognitive instruction on individual students or diagnostic groups, and the effects of the program on the amount of curriculum covered, yielded qualitative data to be summarized and interpreted at a future time. Specific questions asking for detailed information regarding the time spent instructing I.E. or S.P.E.L.T. served as a check as to whether or not teachers were meeting the minimum time requirements (see Appendix C for sample questionnaires).

Phone calls were made to each teacher using a rotational schedule, encouraging consistent program implementation and confirming their importance to the study. This interaction allowed issues to be raised by the teachers on a regular basis. Teachers were also encouraged to initiate phone calls if they had any concerns or questions.

It was suggested during the inservice workshops that, due to the vast area covered by the project, teachers would video-tape lessons and receive the project team's feedback on them. Several chose this option which was offered over and above the school visits.

Two newsletters per year were sent to all participating teachers for communicative and motivational purposes. The newsletters provided information about program implementation, school visits, research results and testing procedures.

Subject Identification

Gifted, average, and learning disabled children were identified at each grade level (4 and 7) from the total initial population of 2,400 students in 1984-85 and 1,600 students in 1985-86. The criteria used for determining these groups follow.

Gifted

Several selection criteria served to identify the gifted sample. In this project, gifted students were those who:

a. obtained scores of 115 or higher (one or more standard deviations above the mean) on the verbal and the non-verbal sub-scales of the Canadian Cognitive Abilities Test (CCAT);

b. were rated as being above average in achievement in reading and at grade or above grade level in math on the Canadian Achievement Test (CAT) [Grade 4 gifted subjects were above 6.0 grade level and grade 7 subjects were above 9.5 grade level in reading comprehension],

c. were rated as being above the mean (of the total study population) on all three of the Renzulli and Hartman's Scales for the Rating of Behavioral Characteristics of Superior Students categories (i.e., motivation, learning and creativity characteristics).

In other words, our "gifted" sample, (the top 12% of our total population) was identified using the above three major criteria, (a) general intellectual ability, (b) specific academic achievement (particularly in language arts, as this is one of the most pervasive overall academic skills required for general school success), and (c) teacher ratings. To ensure that the identification process came from more than just objective pupil performance in intellectual and academic tasks, teachers' ratings of students, with respect to learning characteristics, motivation and creativity were also included within our identification criteria of "giftedness". Such an operational definition of "gifted" was not literature based. Nevertheless, it was decided that the "gifted" sample would be identified from the population under study (regular classroom children), without imposing preset criteria.

One could argue that our cut-off point of approximately 115 on both verbal and nonverbal subtests of the CCAT was too low to capture the "truly" gifted. However, this was done to ensure that we did indeed have the top intellectual ability group available, included in our sample. Researchers have found that children who obtain scores of 115-120 on group ability measures, such as the CCAT, often obtain significantly higher scores when re-tested using individual intelligence tests. Thus a tendency does exist for group measures to underestimate children's ability.

If we have indeed captured a clearly delineated sample of "gifted" children, they should generally display significant differences from our average and learning disabled samples, on a number of dimensions, (i.e., locus of control, self-concept, perceived competence, etc). In our further analysis (presented in sections to follow) clear differences between the three groups at both grades 4 and 7 were noted. We thus feel confident in our selection of a fairly distinct group of "cognitively gifted" youngsters for this study.

Average

In this project, average-achieving students were those who:

a. obtained scores within one standard deviation of the mean on both the verbal and nonverbal sub-scales of the CCAT,

b. obtained achievement scores on the reading and math. sub-scales of the CAT within approximately one standard deviation of the mean.

Learning Disabled

The learning disabled students identified in this study were those who:

a. obtained scores of 85-115 (within one standard deviation of the mean) on both the verbal and nonverbal sub-scales of the CCAT;

b. obtained achievement scores on the reading sub-scale of the CAT approximately one standard deviation or more below the mean [Grade 4 learning disabled students were below the 3.4 grade level and grade 7 subjects were below the 5.4 grade level in reading comprehension].

Within the literature there has not been a generally agreed upon definition or method of defining youngsters with learning difficulties. It is however, generally agreed, that two major criteria must co-exist before the label of learning disabilities can be used (i.e., average intellectual ability and poor academic achievement in one or more areas). The "degree" of discrepancy between expected and actual academic achievement, required for appropriate learning disabled identification, is an open question.

We chose to include children from regular classrooms, who in some cases, are also receiving resource room help. These children were the 11% of our total sample who displayed the greatest discrepancy between intellectual ability and achievement in reading comprehension and vocabulary. Severely learning disabled youngsters were not identified because the intent of the project was to observe the effect of providing cognitive instruction within the regular classroom to youngsters having learning difficulties. The group we identified represents the largest proportion of children normally included within the learning disabled population. Twelve percent of our total grade 4 population and ten percent of our total grade 7 population were included in the learning disabled sample.

Remarks on Subject Identification

In the subject identification process, reading was chosen as the academic measure because it is one of the most important skills necessary for school success (Lerner, 1985). Furthermore, the majority of learning disabled children experience learning difficulties in this area. Consequently, it was the critical achievement measure used in the identification of all three diagnostic groups (i.e., gifted, average, and learning disabled).

To validate group characteristics, analyses were run to determine differences between the learning disabled, gifted and average samples, on measures other than the initial criterion variables. In the majority of these analyses, statistical differences were evident for all three groups on the majority of these variables (see discriminate validity in the test description section). Teacher ratings were also consistent with the above. We feel confident therefore that we have captured three reasonably well-defined diagnostic groups of youngsters (i.e., learning disabled, average and gifted).

Chapter Summary

In this chapter, we presented the overall design of the study with specific details regarding program implementation and subject identification. With respect to program implementation, procedures for integrating the two cognitive education programs into regular school curriculum were reported, and the mechanics used to monitor program implementation were described. Based on intellectual, academic and behavioral characteristics, three diagnostic groups of subjects were identified.

To test the effects of the two cognitive education programs, several types of test instruments were used. These test instruments are described in the next chapter.

CHAPTER 5
TEST INSTRUMENTS

For this study, the *Canadian Achievement Test (CAT)* (McGraw Hill Ryerson, 1985), the *Canadian Cognitive Abilities Test* (Thorndike & Hagen, 1982), Renzulli and Hartman's *Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS)* (Renzulli et al., 1976), Harter's (1982) *Perceived Competence*, Coopersmith's (1981) *Self-Esteem Inventory*, Crandall's (1965) *Intellectual Achievement Responsibility Questionnaire (IARQ)*, Paris' *Reading Awareness Questionnaire* (Paris & Oka, 1986) and several strategy measures were the core group measures which were administered to both grade 4 and grade 7 students. The CAT, CCAT, and Renzulli's SRBCSS were implemented in the pre-test phase as a means of identifying the subjects to be involved in the project. The CAT, Harter's Perceived Competence, Coopersmith's Self-Esteem Inventory, and Crandall's IARQ were implemented at the pre and post-test phases to test the effects of the experimental programs on the students' achievement, self-esteem, and locus of control. The Problem Solving Inventory, Reading Awareness Questionnaire, Cloze Task, and Error Detection Task for Reading, and Math Problem Solving Assessment, were implemented to measure the strategies used at the post-test phases. These tests are described in the following section.

Measure of Cognitive Abilities

Canadian Cognitive Abilities Test (CCAT)

The *Canadian Cognitive Abilities Test* (CCAT) (Thorndike & Hagen, 1982) measures verbal, quantitative and nonverbal reasoning abilities. Though individual tests of cognitive ability would give a more precise profile, because of time constraints, the CCAT was administered. The other advantages of using the CCAT are (1) it is normed on a Canadian population; (2) it is a group measure widely used by schools; (3) the test is easy to administer by the classroom teacher; (4) the scores are provided in the form of standard age scores, stanines, and percentile range scores.

Standardization

The CCAT was normed concurrently with the *Canadian Test of Basic Skills* (CTBS) in 10 provinces in Canada, within 137 school districts involving 30,000 school children. The standardization study for the Level B version was based on a sample of 2,627 children. The means expressed as the percentage of correct answers of the Level B version for verbal, nonverbal, and quantitative abilities were 58.3, 72, and 62 respectively for grade 4. The means provided by a study with 2,973 students of grade 7 were 55.5, 70, and 68.7 for verbal, nonverbal, and quantitative, respectively. Item Discrimination expressed as Biserial Correlations between Item and Subtest Total scores shows the average value of 0.56 for the verbal, 0.59 for nonverbal, and 0.63 for quantitative for grade 4. Item discrimination for grade 7 were $r = .52$, $r = .60$, and $r = .63$ for verbal, nonverbal, and quantitative batteries respectively.

Validity

The manual reports intercorrelations between the *Canadian Test of Basic Skills* and CCAT were 0.85, 0.63, and 0.74 for verbal, nonverbal, and quantitative respectively.

Reliability

Reliabilities reported in the manual expressed as Kuder-Richardson Formula 20, or coefficient alpha, were $r = .93$ for verbal, $r = .92$ for nonverbal, and $r = .89$ for quantitative reasoning batteries for grade 4. They were $r = .92$, $r = .89$, and $r = .90$ for verbal, nonverbal and quantitative abilities respectively for grade 7.

Administration Procedure

The standard age scores were utilized for analyses. The Level B and E versions of the Multilevel Edition of the CCAT were administered by classroom teachers to the total number of grade 4 and grade 7 students respectively as one of the means of determining the three different diagnostic categories. During the post-test after maintenance, Level D and Level G CCAT were administered to the sample grade 6 and 9, respectively.

Measure of Achievement

Canadian Achievement Test (CAT)

The *Canadian Achievement Test* (CAT) (McGraw-Hill Ryerson (1983) consists of two separate batteries measuring skills in reading, language, mathematics and using reference materials. Subtests are further divided into reading vocabulary and comprehension, math computation and math concepts and application. The CAT was used in the study for many reasons. The CAT is a group achievement measure widely used in school systems as it is easy to administer by the classroom teacher. Raw scores, norm-referenced scores (percentile ranks, stanines, grade equivalents, and scale scores), and criterion referenced scores are available to the classroom teacher for diagnostic and instructional purposes. The diagnostic profile for each student was made available to all teachers to assist in their classroom instruction.

Standardization

The CAT was normed on 76,000 Canadian children of different backgrounds, from grades 1-12.

Reliability

The reliability estimates, Kuder-Richardson Formula 20, for levels 14 to 19 of the CAT for reading vocabulary range from 0.83 to 0.88; the KR 20 for reading comprehension range from 0.85 to 0.91 and for total reading, the KR 20 range is 0.91 to 0.94. For math computation, the KR 20 range is 0.88 to 0.92 and math concepts and application KR 20 ranges from 0.86 to 0.90 with total mathematics range of 0.92 to 0.95.

Administration Procedure

In the pre-test phase, the CAT was administered to all subjects as part of the identification process to determine subject inclusion in the different diagnostic groups. The areas of reading vocabulary, comprehension, math computation and math concepts and application at Level 14 and Level 17 for grades 4 and 7 respectively, were administered. These tests were readministered by the teachers during each post-test phase to the subjects who comprised the three different diagnostic groups, (post year 2 session Level 15 for grade 5 and Level 18 for grade 8 and during the maintenance year, Level 16 for grade 6 and Level 19 for grade 9).

Measure of Behavioral Characteristics

The Scales for the Rating of the Behavioral Characteristics of Superior Students (SRBCSS)

Renzulli and Hartman's *Scales for the Rating of the Behavioral Characteristics of Superior Students* (SRBCSS: 1976) are designed to provide a relatively objective and systematic instrument to assist teachers in identifying gifted students. The scales focus on ten abilities. Three of these subtests (i.e., Learning, Motivation, and Creativity) were selected and used within the project to screen subjects in the pre-test phase and these three scales were felt to be very important variables to identify the gifted/talented. As well, the SRBCSS was chosen because it is one of the better rating scales that uses the teacher's perspective in the identification of superior students.

Validity

Validity of the Learning and Motivation Scales was examined by the original authors, by correlating ratings with scores on standardized intelligence and achievement tests. Significant correlations were obtained which ranged from .36 for the Motivation Scale and Intelligence to .61 for the Learning Scale and Intelligence. Validity of the Creativity Scale was determined by comparing ratings with sub-scores of the *Torrance Tests of Creative Thinking* (TTCT). Significant correlation coefficients were found between this scale and the verbal sub-scores of the TTCT (r= .35 - .68).

Reliability

Reliability coefficients were obtained by the original author who had two sets of teachers rate the same fifth and sixth grade students twice within a three-month interval. Statistically significant stability coefficients ranged from .77 (Leadership Scale) to .91 (Motivation scale). Inter-rater reliability coefficients were also statistically significant, and ranged from .67 (Leadership Scale) to .91 (Creativity Scale).

Administration Procedure

Teachers in the study completed the questionnaire by rating all their students on a four point scale (1 being **seldom** or **never** and 4 being **almost always observed**), on questions such as: **Does the child have "quick mastery and recall of factual information?"** The total score for each of the three sub-scales (Learning, Motivation and Creativity), was used to identify the gifted sample. The criterion used were scores above the study population mean on all three scales.

Measures of Affective Perceptions

In evaluating the two programs (I.E. and S.P.E.L.T.), the project team determined the programs' effects on the affective domain with respect to perceived competence, self concept, and locus of control. The following measures were administered at pre-test and each post-test by the classroom teacher (the project team administered the group tests if teachers were unable to do so).

Perceived Competence: Harter's Perceived Competence Scale

This scale measures children's self-perceptions on four sub-scales, cognitive, social, physical and general. The cognitive sub-scale measures children's views of their academic abilities, the social sub-scale measures children's views of their social skills and popularity, the physical sub-scale measures children's views of their physical abilities related to sports, etc., and the general sub-scale measures children's views of self which is a measure of general self esteem. The Harter scale was chosen because of its good construct validity and reliability. It also is appropriate for the complete age range involved in the study.

Validity

The factor structures obtained with subjects aged 8 - 12 (N=341) clearly specified four factors corresponding to the four sub-scales. This has been further replicated in additional studies (Harter, 1982). Factorial validity was conducted on a New York sample of 810 students reporting the average loadings of items on the designated factors of cognitive, social, physical, and general sub-scales to be .67, .61, .64, and .50 respectively. Convergent validity with pupil and teacher ratings in the cognitive domain demonstrated a developmental trend. Correlations for third, fourth, fifth, sixth, seventh, eighth, and ninth grades were reported to be .28, .32, .50, .31, .66, and .73, respectively. Baarstad (1978) in a study with learning disabled children reported discriminant validity in the cognitive area when learning disabled students were compared to regular children.

Reliability

Harter has reported reliability scores (KR 20 internal consistency) of .76, .78, .83 and .73 for the cognitive, social, physical, and general sub-scales respectively. Test-re-test reliability on 208 Colorado pupils after three months, and a sample of 810 pupils from New York after nine months was reported to be .78, .80, .87, and .70 for Colorado and .78, .75, .80, and .69 for New York for the respective sub-scales.

Administration Procedure

Harter's *Perceived Competence Scales* all have identical formats that provide brief descriptions of two types of children. Example:

> "Some kids feel that they are good at their school work BUT other kids worry about whether they can do the work assigned to them."

These contrasting descriptions were presented as being equally likely. The children were first instructed to pick the child who was most like them. The second step involved deciding whether the statement was either "really true" or "sort of true" for them and marking the appropriate letter for that question, on a computer sheet. This resulted in a score between 1 and 4 for each of the items with a high score representing high perceived competence. A total score was derived for each subject for each of the four sub-scales and this was divided by the number of items (seven) to arrive at a mean sub-scale score. These scores were then used in the statistical analysis as dependent measures. The maximum score obtainable for each subtest was four.

Self Concept: Coopersmith Self-Esteem Inventory

The Coopersmith *Self-Esteem Inventory* (Coopersmith, 1981) was designed to measure evaluative attitudes toward the self in social, academic, family and personal areas of experience. Self-esteem is believed to be significantly associated with personal satisfaction and effective functioning. The Coopersmith inventory also was chosen because of the relationship of the subtests with the Harter scale.

The inventory used for this study was the school form which is generally used with students aged 8 through 15 and consists of 58 items. The self-esteem items yield a total score and five separate sub-scale scores, (i.e., general self, social self-peers, home-parents, school-academic, and lie).

Validity

The validity of the total score is relatively good. As Peterson (1985) indicates in the Burros Mental Measurement Yearbook, ninth edition, the Coopersmith scores"... are reliable and stable and there exists an impressive amount of data bearing on their construct validity" (p. 398).

Reliability

In an internal consistency study, including students of all socio-economic ranges, Kimball (1972) obtained Kuder-Richardson reliability estimates (KR 20) of .92 and .89 for grade 4 and 7 respectively for total self score. Subscale intercorrelations calculated by Donaldson (1974) ranged from .02 to .52. The school and general self concept scores were utilized for analyses in this study.

Administration Procedure

Teachers administered the quetionaire to groups of students. See appendix D for the specific instrctions provided to subjects.

Negative items were scored correct (for example, "I get upset easily at home"), if they have been answered "Unlike me." Positive items were scored correct (for example, "I'm pretty sure of myself"), if they have been answered "like me".
The total self score, which is the sum of the number of correctly answered items (excluding those items used for the detection of lies), was multiplied by two, resulting in a possible total self score of 100.

For this study the areas of school and general self-concept were selected for analysis because these areas are related to academic learning. These two areas were also selected because of relatively high reliabilities which have been obtained for each subscale.

Locus of Control: Crandall's Intellectual Achievement Responsibility Questionnaire (IARQ)

The role of an internal locus of control (Crandall, Katkovsky, & Crandall, 1965) and the notion of self-regulation appear to be important aspects that contribute to increased motivation on the part of the student. There is an evolving perception that successful strategy training has an impact on the total person's perceptions of self and the ability to control future problem solving situations.

An internal locus is attributed to individuals who perceive the outcomes of their behavior to factors which are internal to themselves such as their effort, strategies and/or ability. The external individuals attribute their success and/or failure to causes external to themselves and hence beyond their control. This variable was selected as it is expected to be influenced by the two experimental procedures at the end of the three years (i.e., youngsters who have participated in the two cognitive education programs should demonstrate a greater degree of internal locus of control compared to the control subjects).

The test selected was the *Intellectual Achievement Responsibility Questionnaire* (Crandall, Katkovsky, & Crandall, 1965). This questionnaire examines children's beliefs regarding responsibility for outcomes in academic achievement situations. It is the appropriate measure of locus of control beliefs in children in the relatively specific area of intellectual-academic achievement (Phares, 1976).

Validity

In terms of convergent validity there has been found to be a moderately high correlation between this measure and report card grades (r = 0.54 - 0.58) (Crandall, Katkovsky, & Crandall, 1965). The IARQ scores are positively and significantly related (.34 to .53) to reading, language, and math sub-scores and total achievement-test scores as well as report cards in the elementary grades. The IARQ has been extensively used in research related to achievement and academic performance.

Reliability

Test-re-test reliability of the IAR was reported by Wolk and Eliot (1974) to be .55 for internal success positive, .60 for internal failure and .62 for total internal scores. Similarly, Crandall, Katkovsky, and Crandall (1965) reported that the test-re-test reliability was .66 for internal positive, .74 for internal negative and .69 for total internal scores on the IARQ after two-month interval. These correlations were all significant at the p<.001 level. Seventy ninth-grade subjects were similarly tested and revealed reliability coefficients of .47 for internal positive, .69 for internal negative, and .65 for total internal scores which were also significant at the p<.001 level. Crandall, Katkovsky, and Crandall (1965), testing a sample of 923 elementary and high-school students from five different schools representing children from diverse kinds of communities, reported split-half reliabilities for the two sub-scales of the IARQ from a random sample of 130 and 923 elementary subjects to be .54 for internal positive and .57 for internal negative scores. A similar random sample with older children revealed correlations of .60 for both internal positive and internal negative scores.

Administration Procedure

The test itself consists of 34 items to which the subject checks one of two answers indicating either an internal locus of control or an external locus of control (e.g., if you solve a puzzle quickly, is it (a) because you worked on it carefully, or (b) because it wasn't a very hard puzzle?). The questionaire was administered by the teachers in groups.(see appendix D for instructions provided). The total response from each subject was scored to arrive at an overall degree of internal locus of control score. This was then used in all statistical analysis.

Measures of Cognitive Strategies

The following tests (Paris' *Reading Awareness Questionnaire, Cloze Task, Error Detection Task*, and *Math Problem Solving*) were not available for initial use at pre-test as time did not permit these tests to be selected and developed. Therefore each of the following strategy measures were utilized at each of the post-test points. With the assumption of random assignment of students to conditions which did occur at the initial stages of the study, implementation of the post-test only measures are acceptable.

The area of reading and metacognition was assessed utilizing three major tasks on an group basis (At post-test one, individual assessments involved both a cloze task and an error detection task).

Reading Awareness Questionnaire

This reading awareness instrument, developed by Paris and Oka (1986), was chosen because it contains questions about children's awareness of the evaluation, planning, and regulating of skills involved in reading as well as sets of questions designed to tap conditional strategies used to reach specific goals (e.g., writing a book report). According to Paris, the overall index measures many different facets of reading, including evaluation of one's self and the task, planning ahead, monitoring one's own progress, and the use of strategies to reach specific goals which are skills emphasized in the two experimental programs. It also has good validity/reliability (see below).

An example of one of the multiple-choice items is:

What is the hardest part about reading for you?

a) Sounding out hard words.

b) When you don't understand the story.

c) Nothing is hard about reading for you.

Each question is followed by three choices worth 0, 1, or 2 points. The order of choices is random. Responses in the zero category are inappropriate or deny the problem. Responses in the one point category are adequate responses based on decoding external features of the text or vague references to affective or cognitive ideas, but include no mention of a specific strategy. Choices receiving 2 points are good responses that are evaluative, planful, or showed awareness of goals and strategies. Scores to the 22 questions on the multiple choice index are combined to produce a total score ranging up to 44 points for each subject.

Validity

Paris obtained significant differences in this particular measure for good and poor readers as well as differences in experimental groups relative to reading strategy instruction versus control groups. We also obtained diagnostic differences at both grade 4 and 7.

Discriminant validity was further examined in this project by testing the differences among different diagnostic categories. Clear evidence was shown for both grade 4 and 7 subjects. More specifically, among diagnostic categories, significant differences, at the level of $p \leq 0.001$, were shown in strategy use for grade 4 with means of 27.0, 29.5, and 33.4 for learning disabled, average, and gifted, respectively. The same trend was shown for grade 7 with means of 30.9, 33.8, and 36.1 for learning disabled, average, and gifted, respectively. Thus relatively high discriminant validity was evident. Correlations with CAT reading comprehension and vocabulary were .37 and .34, respectively.

Reliability

Paris found test-re-test reliability for a group of 544 elementary school 3rd and 5th grade children after an eight month interval, yielded a correlation of $r = .55$, $p < .001$. There were no floor or ceiling effects evident for either of the two grade levels. Within the project study as well, the grade 7 students did not demonstrate a ceiling effect, giving a range of scores of 22-41, with a mean of approximately 31. The standard deviation for items ranged between .49 - .89. The test therefore has reasonable test-re-test reliability and adequate ranges for grades 3 to 7.

Administration Procedure

The test items and choices were read out to grade 4 students. Students were then asked to check off their response on the questionnaire. Responses were then summed to arrive at a reading strategy awareness index with a possible maximum score of 44. For further test development, the score for each subject on each item was coded for subsequent item analyses (See Appendix C for the questionnaire item examples). This measure was also utilized during the Post year 2 and Maintenance sessions, at which time the test items and choices were read silently by both the grade 4 and 7 students being tested.

Cloze Task

The cloze task is a procedure in which words are systematically omitted and students are then required to generate words to fill in the blanks. The task requires the generation of semantically and syntactically appropriate words, based upon the readers' understanding of the passage. The cloze task itself has been found to successfully assess the readers' abilities in literal comprehension, comprehension of the main idea, inferential comprehension and structural awareness. The cloze is a valuable task to rate comprehension and the use of context as a strategy. (See validity and reliability sections below). It has been used by some researchers to evaluate the cognitive strategies that youngsters use in reading comprehension (Beebe, 1984; Paris and Jacobs, 1984; Paris and Oka, 1986). It was therefore used in the context of this study as a measure of use of contextual strategies in comprehension as well as a specific measure of reading comprehension.

The procedure utilized in the study was the typical situation requiring subjects to read the story and fill in the blanks. The responses were then scored according to the appropriateness of the word selected.

The passages were selected from the Spache Diagnostic Reading Test (1972) and texts used in the schools. The following procedure was used to convert the intact passages to cloze passages.

a. The first sentence was left intact.
b. Words deleted were limited to nouns and verbs with a few adjectives being deleted. These were chosen to be deleted as earlier work had indicated that they brought out more strategies with less frustration (French, 1983).
c. The average deletion ratio was one out of every seven words.
d. The length of the passages ranged from 152 to 253 words. The mean number of blanks per story was 23.5, with a range of 15 to 32 blanks. (The passages used can be found in Appendix D).

Validity

The validity of this task has been assessed in a variety of ways as referenced in the literature (Taylor, 1980). The cloze task is considered to be a good measure of reading comprehension and use of contextual strategies. Discriminant validity was examined within the study by testing the group differences among different diagnostic categories at pre-test. Significant differences were shown among the three groups in semantically/syntactically correct answers (**synonyms**) ($p<.001$), and **absolutely correct answers** ($p<.001$). Thus fairly high discriminant validity was evident in this task.

Reliability

The initial estimates of reliability were based on a measure of the internal consistency between subcategories, which was represented in the form of correlation coefficients. Among different categories of answers, syntactic, semantic, both syntactically and semantically correct or absolutely correct, the values ranged from $r=.67$ to $r=.84$. This may account for the fact that the subcategories of answers measure strategies of a similar nature.

In order to ensure reliability in scoring the Cloze Task results, an inter-rater reliability was calculated for a group of 20 protocols randomly selected from the total pool available. Three raters, two trained teachers and one psychology graduate, blindly scored each protocol. The percentage of agreement was then calculated. This resulted in an overall agreement of 87%, a reasonably high degree of inter-rater reliability.

Administration Procedure

At post-test 1 a subject was given the practice story and one story at approximately grade level. Eight different stories of increasing difficulty levels corresponding approximately to the reading level of the learning disabled, average, and gifted, for each of grades 4, 5, 6, 7, 8 and 9 were selected for use during each post-test. Once a child had completed the trial story, s/he was given the age-appropriate story with instructions to read the story silently to her/himself. At post-test 2 and the post-test at maintenance the Cloze Task was given in a group setting with instructions to read the passage silently filling in the blanks with one word. No trial story was given as they were already familiar with the story.

Scoring

Words which the children placed in the blanks were scored in four categories: **absolutely correct, both semantically and syntactically correct (synonyms), semantically appropriate** or **syntactically appropriate.**

a) **Absolutely correct**: if the word was that which was originally used by the author of the paragraph, b) **both semantically and syntactically correct**: if the word was semantically and syntactically appropriate, in the context of both the sentence and the story, c) **syntactically appropriate**: words which were in keeping with the construction of the sentence; d) **semantically appropriate** words that do not change the meaning of the sentence but are not in the proper grammatical form.

However, as at the initial analysis the numbers were so small for the **syntactic**, only and **semantic** only that they didn't discriminate so responses were scored only as both **synonyms (syntactically and semantically appropriate**) and **absolutely correct** (the exact words the author had used).

Comprehension Monitoring: Error Detection Task

Error detection is a task in which students must detect incongruous words and scrambled sentences in a story. It is a method for determining how children monitor their comprehension by measuring their awareness of faulty comprehension (Paris & Oka, 1986). This task requires that the child determine if the information makes sense, if it follows logically from previous material, etc. The two cognitive education programs are designed to develop ability in monitoring one's progress in a task, and evaluating personal understanding so this particular measure may be a relatively good criterion measure of program impact.

A series of approximately grade-appropriate stories, and slightly more difficult stories for each of the diagnostic groups at each of grades 4 through 9 was selected from text used in schools and the *Spache Diagnostic Reading Text* (1972) (See Appendix D for sample passages). Story length varied between 163 and 257 words. For each story three words and three different phrases were replaced to disrupt comprehension of the passage. The ability of the children to detect the anomalous information was taken as a measure of their comprehension monitoring.

Validity

The validity has been assessed in a variety of ways and established as indicated by Paris and Oka (1986). Our attempt to assess the concurrent validity of this task was based on the correlation analysis between the Error Detection Task and other tasks which measured reading comprehension. The correlation coefficients between the Error Detection questions of stories and the Reading Comprehension Subtest of the CAT was significant for grade 4 ($r=.35$, $p<.001$) and for grade 7 ($r=.44$, $p<.001$), reasonable concurrent validity for the error detection task. These results were expected, as the stories and questions were taken directly from the *Spache's Diagnostic Reading Tests* and texts used in schools.

Reliability

In order to ensure reliability in scoring the responses on the Error Detection Task, an inter-rater reliability was calculated for a group of 20 protocols randomly selected from the total pool available. Three raters, two trained teachers and one psychology graduate, blindly scored each protocol. The percentage of agreement was then calculated. The result was an overall agreement of 82%.

Administration Procedure

Each child was given an approximately grade-appropriate story first, with the instructions that s/he was to read carefully, and underline "anything" in the story that did not make sense. Upon completion of the first story, a second, more difficult story (a story at about frustration level) was then given to the child to read, and the above procedure was repeated. The story which was given above grade level was then administered in the following year as one at approximately grade level for ease of story selection. Practice effects after one year should be minimal and in any case would be the same for both experimental and control students.

Scoring

The number of words and sentence errors that the children detected were recorded separately, as were the number of "extra" (non-error) words and sentences underlined. (Each sentence scored a maximum of one error, or extra non-error independent of the number of single errors or non-error in the sentence). If any portion of an erroneous word or sentence was underlined, credit was given for an error detected. The total error detection score for each of the two stories administered was **six.**

Perceived Problem Solving Ability: Perceived Problem Solving Inventory (PPSI)

The *Perceived Problem Solving Inventory* (PPSI) developed by Heppner and Petersen (1982) attempts to examine the underlying dimensions of people's perceptions of their real-life, personal problem-solving process. It consists of a 6-point, Likert-type format of 35 items constructed by the authors as measures of three problem-solving dimensions: problem-solving confidence, approach-avoidance type, and personal control. This particular instrument was not obtained until the final years of the project and was thus used only at the final test point. It was chosen as it attempts to evaluate the problem solving perceptions of students and problem solving strategies are emphasized in both experimental programs. The scale was originally developed with high school students. The project team adapted the questionnaire for elementary and junior high students by lowering the level of vocabulary but maintaining the essential question element. The questionnaire was then given to some elementary and junior high students out of project to assess readability, which was found to be adequate.

Example of original question:

> "When I am confronted with a complex problem, I do not bother to develop a strategy to collect information so I can define exactly what the problem is."

Altered question for elementary and junior high students:

"When I have a difficult problem, I do not take the time to make a strategy to collect information so I can figure out exactly what the problem is."

Validity

Heppner and Peterson (1982) evaluated concurrent validity by establishing the correlation of the PPSI scores with students' ratings of their levels of problem-solving skills and students' perceived satisfaction/dissatisfaction with their problem-solving skills. All correlations, ranging from -.29 to -.46, were statistically significant ($p < .001$).

Construct validity was also examined by the authors, by correlating the PPSI scores with scores on intelligence and achievement tests. All correlations were statistically nonsignificant ($p > .05$). Thus, the instrument is not correlated with intelligence measures or academic achievement.

Reliability

Estimates of reliability indicated that the three dimensions and the total inventory are internally consistent. Significant internal consistency coefficients ranged from .82 to .90. Test-re-test reliability coefficients were also statistically significant, ranging from .83 to .89.

Administration Procedure

The inventory was administered to all students in the study by the project team at the end of the maintenance year. Students were asked to choose the response that was "most like them". The answers were scored on a 6-point scale with higher scores indicating behaviors and attitudes typically associated with successful problem solving.

Math Problem Solving Strategy Assessment

Test construction

Two math problems for each level, elementary and junior high, were prepared to assess the types of strategies students used. Each problem illustrated specific problem solving strategies endemic to each grade level (i.e., grade 4 and 7).

The general characteristics of the math problems were that: (1) they involved mathematics in some way, (2) they were of interest to the child, (3) they required the child to interpret and to modify the solution process, when necessary, (4) they allowed for several methods of solution, and (5) they allowed the child to feel that he or she both wanted to and could solve the problem. The problems utilized in this study were selected from the Alberta Education document *Let Problem Solving Be the Focus for the 1980's* (1983).

A pilot study was conducted using 18 students from each of gifted, average, and learning disabled categories from grade 4 and grade 7 in an attempt to determine the obstacles which children experience in problem solving. Dialogues between the subjects and examiners were tape recorded. The contents of these verbal protocols were then analyzed in terms of spontaneous strategy use and type and number of prompts required for each child to solve the math problems. These prompts and strategies were than formed into an observational list for each math problem (see Appendix D for test examples).

Description of math strategies on observational list

Restating problem in own words:
student has stated that "The problem is to..." or has summarized the problem he has just read.

Rereading:
student had stated he has reread the problem or is observed to read and/or point out sections (or all of the problem).

Considering alternative interpretation of the problem:
student had derived a different meaning than one intended in the problem, has not identified relevant information (i.e., "I forgot..."/ "I see this now."). The student then may begin to alter solution procedures.

Stating plans or solution procedures:
student verbally stated step-to-step procedures he took to solve problem or points to what he had done (i.e., "I did this first...").

Using symbols:
student used X or Y or other "unknown."

Writing down equations:
equations did not need to include an unknown.

Using manipulatives:
student had been observed or student has stated the use of concrete materials (e.g., ruler, pencil, table...) to act out the problem or solution process.

Guessing and checking:
student has been observed making or states he has estimated or guessed. He may have been observed checking his answer by rereading, redoing or altering the solution process.

Looking for alternative ways of solving the problem:

> student has diagrammed (work has been crossed out, is being erased) or stated two or more different methods (e.g., draws a picture and then writes equations) used in solving the problem.

Generalizing solutions:

> student has referred to a similar problem he had done before, or has used a similar problem with different quantities and generalized.
>
> student has been taken to Prompt level 4 where he has been given a modified version of the problem and the student is observed to take that solution and make parallels to the first problem to get solution.

Determine the reasonableness of the answer:

> student had solved the problem and has shown or has stated how he had checked the answer.

Other:

> students were observed using strategies other then those listed (e.g., draw a picture). The frequency of these strategies was too small to analyze.

The above strategies do not form any particular hierarchy.

Validity

The attempt to assess the structural validity used a factor analytic procedure. The factor analysis identified three categories of strategies involved in mathematical problem solving. The subjects themselves discriminated between the three different strategy components, which were established on the basis of theory. The factor structure included **planning, carrying out the plan,** and **monitoring.**

Discriminant validity was also examined by testing group differences among different diagnostic categories. Significant evidence was shown in planning strategies use between average and learning disabled ($p<.002$) and trends were noted between grade 4 gifted and average ($p<0.065$). For grade 7, the strategies used to carry out original plans discriminated the gifted from the learning disabled groups ($p<.033$).

The number of prompts used to help students reach the correct answers also clearly discriminated gifted from the other two diagnostic categories. More specifically, the number of prompts needed for grade 4 were 4.7, 4.6, and 3.6 for learning disabled, average, and gifted respectively. Similarly, the number of prompts needed for grade 7 were 2.4, 2.0, and 1.3 for learning disabled, average, and gifted, respectively.

Since the diagnostic categories were originally defined on the basis of reading achievement, a very clear discriminant validity in mathematical problem solving was not necessarily expected.

Administration Procedure

During all three post-tests the examiner explained the procedure of this task before the individual student started to solve the problem. Students were asked to think aloud, verbalizing whatever came into their mind as they tried to arrive at the correct answer. Whenever it appeared that a subject's strategies for problem solving were being blocked, examiners followed a hierarchy of prompts and guided the problem solving processes, until the correct solution was reached (The examiner used a hierarchy of prompts, from general to specific, formulated from the pilot study). When the student arrived at the correct answer, the examiner then checked off the level of prompts given to the student. The maximum number of prompts that could be given was 6 and 5, respectively for the first and second grade 4 problems and 6 and 7 for each of the grade 7 problems. A list of strategies, derived from the research literature, was also prepared for the examiners to use in checking off the strategies generated spontaneously by each subject (i.e., those used without the help of prompts).

At Phase 1, post-test one, 19 strategies were listed, but because there was a very low frequency for some strategies, 13 strategies were listed for following test points. Once the testing period was over prompt level and strategies were checked off (See Appendix E for a complete description of prompts and checklist of strategies). Of these 13, the strategies which were identified as being observed most frequently assessed in the final analyses, were **rereading, stating plans, determining reasonableness of an answer, guessing and checking, using manipulatives,** and **determining alternatives**. The other documented strategies were not used frequently enough to enable meaningful statistical analyses.

Essentially all subjects were able to solve the problems. The frequency of strategy use was summed for the two problems to provide the total frequency for each strategy for each subject.

Chapter Summary

Several test instruments were utilized in this study and could be grouped in four categories: general intelligence (cognitive abilities), achievement (reading, mathematics), social/affective perceptions (behavioral characteristics, social competence, self-concept, locus of control), and cognitive strategies (reading, mathematics, and problem solving strategies). Most measures were implemented in both the pre-test and post-test phases to test the effects of the experimental programs. Measures of cognitive strategies were not available at the pre-test point and were administered at the post-test phase only. Moreover, three tests (CCAT for Cognitive ability measure, CAT for achievement measure, and SRBCSS for measure of behavioral characteristics) were used to identify subjects for the study at the pre-test phase. Analyses of these pre-test results for Phase 1 students are reported in the following chapter.

Chapter 6

PRE-TEST ANALYSES OF PHASE 1 SUBJECTS

In order to provide an initial check on the randomization of schools to experimental treatment in the first year of the study, the following pre-test analyses were carried out at the end of the first year of the study for all students involved in Phase 1. The purpose was also to provide data on initial identification of the student groups of learning disabled, average, and gifted as well as some preliminary indication of pre-test levels of students across the initial experimental groups (I.E., S.P.E.L.T., Control). The final data analyses utilized repeated measures analyses using testing time as the repeated factor. This builds in the pre-test as one level of the analysis, thus controlling for pre-test levels.

As mentioned previously, subjects were selected according to achievement measured by *Canadian Achievement Test* (CAT), cognitive ability measured by *Canadian Cognitive Abilities Test* (CCAT), and behavioral characteristics as measured by Renzulli and Hartman's *Behavioral Characteristics Rating Scale.* To determine whether any pre-test experimental group differences existed in the above, an initial statistical analysis was run for each variable. In order to provide greater ease of reading, the specific ANOVA characteristics utilized will not be repeated for each variable, since the same basic analyses were utilized for all variables. This consisted of a two way ANOVA (I.E., S.P.E.L.T., Control) and (learning disabled, average, gifted) for each dependent variable. The following are the results of these analyses. The summary ANOVA tables can be found in appendix F (Tables 1 to 14). Table 8 (grade 4) and Table 9 (grade 7) are summaries of the number of subjects and means and standard deviations for all variables after one year of instruction.

Grade 4 Phase 1 Subjects

Cognitive Abilities: CCAT

Verbal Ability

The results of the analyses indicated a significant main effect for diagnostic category ($p < .001$). No significant main effect for the group or significant interaction of group by diagnostic category was evident. However, the learning disabled, average, and gifted students were significantly different with respect to verbal ability. The means were 93.0 for the learning disabled, 100.4 for the average, and 126.7 for the gifted group. Tukey's multiple comparison showed that all three diagnostic categories were different from each other ($p < .001$).

Nonverbal Ability

On nonverbal ability, the ANOVA obtained similar results as on the Verbal subtest, indicating a significant main effect for diagnostic category, but no significant main effect for group or interaction effects of group by diagnostic categories. Means for the learning disabled, the average, and the gifted groups were 96.3, 100.3, 121.5, respectively. Tukey's multiple comparison showed significant differences among gifted and the other two groups but not between learning disabled and average achievers.

Quantitative Abilities

The ANOVA results for quantitative abilities, were similar to the other two subtests. The result indicated a significant main effect for diagnostic category ($p < .001$), but no significant main effect for groups or interaction for group by diagnostic category. Tukey's multiple comparison showed that both learning disabled and average were significantly different from the gifted, whereas the learning disabled and the average group were not significantly different from each other. The result was as expected.

Academic Achievement: CAT

Reading Total

The ANOVA results indicated no significant main effects for groups or group by diagnostic interactions. All groups and diagnostic categories across groups were at comparable initial pre-test levels. Furthermore, Tukey's multiple comparison for the diagnostic category confirmed the significance of differences among diagnostic categories (i.e.,Means for learning disabled: 2.81; average: 4.52; and gifted: 8.75).

Mathematics Total

The ANOVA revealed no significant group differences occurring at pre-test. In addition, there was no group by diagnostic category interaction effect. However, as shown in reading achievement, there was a significant main effect for the diagnostic categories. Tukey's multiple comparison confirmed that the three diagnostic categories were significantly different from each other (i.e., means for learning disabled: 3.76; average: 4.37; gifted: 6.00). Thus, all groups and diagnostic categories across groups were at comparable initial levels.

Behavioral Characteristics (SRBCSS)

Learning

The ANOVA results obtained a significant main effect for diagnostic category (p < .001), but no main effect for group and no interaction effects for group by diagnostic categories. The means for the learning disabled, average, and the gifted were 11.1, 13.1, and 21.9 respectively. Further analyses by Tukey's multiple comparison showed that the learning disabled, average, and gifted groups were significantly different from each other. Overall, the three diagnostic groups were observed to be significantly different from each other in their learning characteristics. This fact provides further validation of the diagnostic group characteristics.

Motivation

The ANOVA obtained a significant main effect for diagnostic categories and groups but no significant interaction effect between group and diagnostic categories. The means for the learning disabled, average and the gifted were 14.9, 16.2, and 22.3 respectively. Tukey's multiple comparison showed that all the diagnostics groups were significantly different in motivational characteristics. The means for I.E., S.P.E.L.T., and Control were 17.9, 18.7, and 16.6, respectively.

Creativity

On creativity, a significant main effect was obtained for diagnostic categories (p < .001), but no significant main effect for group or no interaction between group by diagnostic category were evident. Tukey's multiple comparison showed significant differences among all the diagnostic categories. The results indicated that the gifted were observed by teachers to be more creative than the average group. This was in turn recognized as being observed to be more creative than the learning disabled group. Means for the gifted, average and learning disabled were 24.5, 17.8 and 15.3 respectively. The results of the teacher ratings provides further validation overall with respect to the classification of subjects into the diagnostic categories.

Table 8

Grade 4 Phase 1 Subjects

		Learning Disabled	Average	Gifted
Number of subjects (end of year 1)				
I.E.	Initial	43	43	41
	Final	37	39	37
S.P.E.L.T.	Initial	36	37	33
	Final	27	28	27
Control	Initial	34	40	38
	Final	26	36	33
Canadian Achievement Tests: Reading Performance (Grade Equivalent)				
I.E.	Mean	2.82	4.61	8.60
	SD	0.52	0.52	1.91
S.P.E.L.T.	Mean	2.79	4.46	9.11
	SD	0.47	0.40	1.95
Control	Mean	2.83	4.48	8.60
	SD	0.55	0.52	1.69
Canadian Achievement Tests: Math Performance (Grade Equivalent)				
I.E.	Mean	3.73	4.47	6.13
	SD	0.84	0.77	1.02
S.P.E.L.T.	Mean	4.47	5.16	6.97
	SD	0.72	0.68	1.09
Control	Mean	3.73	4.30	5.79
	SD	0.63	0.70	1.80
Canadian Cognitive Abilities Test: Verbal Ability				
I.E.	Mean	92.5	103.8	125.4
	SD	9.1	9.2	6.3
S.P.E.L.T.	Mean	94.3	101.0	126.2
	SD	6.5	8.2	6.9
Control	Mean	92.4	102.6	128.6
	SD	9.3	8.0	9.8

Table 8 (continued)

Grade 4 Phase 1 Subjects

		Learning Disabled	Average	Gifted
Canadian Cognitive Abilities Test: Nonverbal Ability				
I.E.	Mean	99.7	99.6	121.4
	SD	10.3	8.0	11.0
S.P.E.L.T.	Mean	94.3	101.4	121.9
	SD	10.6	10.0	10.3
Control	Mean	93.0	100.1	121.1
	SD	8.5	8.0	11.4
Behavioral Rating Scale: Learning				
I.E.	Mean	11.4	13.9	21.5
	SD	4.2	5.3	5.6
S.P.E.L.T.	Mean	10.7	14.4	22.7
	SD	3.2	4.6	5.2
Control	Mean	10.8	11.4	21.4
	SD	6.1	3.2	3.3
Behavioral Rating Scale: Motivation				
I.E.	Mean	14.9	17.2	23.0
	SD	4.0	5.0	5.7
S.P.E.L.T.	Mean	15.5	17.4	22.7
	SD	3.4	4.2	4.3
Control	Mean	14.1	14.3	21.2
	SD	3.9	3.2	6.0
Behavioral Rating Scale: Creativity				
I.E.	Mean	15.8	16.4	15.8
	SD	5.3	5.6	5.9
S.P.E.L.T.	Mean	16.0	18.0	24.0
	SD	4.9	5.7	6.8
Control	Mean	14.5	15.4	22.1
	SD	4.7	4.9	6.7

Grade 7 Phase 1 Subjects

During the first year of the project, the original plan called for the majority of I.E. schools and a few control schools from the Edmonton Public District to be included in the study. However, the research team made the decision to include more grade 7 controls in order to allow for some preliminary statistical comparisons between I.E. and control subjects. The S.P.E.L.T. schools for grade 7 were phased in during 1985/86 along with an additional block of control schools and I.E. classes, to complete the sample.

Cognitive Abilities: CCAT

On each of the verbal and nonverbal abilities subtests, the ANOVA obtained a significant main effect for diagnostic category but no main effect for experimental groups and no interaction effects between experimental groups and diagnostic categories. The results indicated that the learning disabled, the average and the gifted groups were significantly different in their verbal ability. The means for the learning disabled, the average, and the gifted were 93.1, 102.0 and 121.7, respectively.

The means on the nonverbal battery for the learning disabled, the average and the gifted groups were 96.9, 100.4, and 122.0, respectively. Tukey's multiple comparison showed that the learning disabled, the average, and the gifted students were significantly different from each other on verbal ability. On nonverbal abilities the learning disabled and the average groups were not significantly different, whereas the learning disabled and gifted as well as average and gifted showed significant differences in all these subtests. This result was as expected, since the diagnostic groups were selected with reading achievement being the major criterion of academic performance. On the verbal subtest of the CCAT, therefore, the learning disabled and the average would be different because of the high correlation between verbal ability and reading performance.

Academic Achievement: CAT

Reading Total

The ANOVA results indicated significant main effects for diagnostic categories ($p<.001$). The main effect for diagnostic categories indicates that the learning disabled group showed the lowest reading performance (Mean = 3.98), followed by the average group (Mean = 7.22), which was followed by the gifted group (Mean =11.51). Tukey's multiple comparison indicated that all the diagnostic categories were significantly different from each other at the ($p<.001$) level.

Mathematics total

The ANOVA results indicated no significant main effect for group and no significant interaction of group by diagnostic categories. However, it indicated a significant main effect for the diagnostic categories ($p<.001$).

The main effect for diagnostic categories appears due to the lower math performance of the learning disabled (Mean = 6.80), followed by the average (Mean = 7.72), followed by the gifted (Mean =10.29). Tukey's multiple comparison indicated all three diagnostic categories were significantly different from each other. The test results indicated that all the subjects across experimental groups were comparable at the pre-test level.

Behavioral Characteristics (SRBCSS)

Learning

The ANOVA obtained significant main effects for diagnostic categories ($p<.001$), but no interaction effects between group and diagnostic categories. Tukey's multiple comparison indicated that all diagnostic categories showed significantly different means (i.e., learning disabled: 12.1; average: 15.4; and gifted: 23.5). The results indicate that learning disabled, average, and gifted group were different in learning characteristics.

Motivation

The ANOVA obtained significant main effects for diagnostic categories ($p<.001$). Tukey's multiple comparison indicated all the diagnostic categories were significantly different from each other. Means for learning disabled, average, and the gifted were 15.3, 17.8 and 24.5. The result also indicated a significant main effect for group ($p<.034$) with the I.E. condition being higher (Mean = 20.7) than the control condition (Mean = 15.7).

Creativity

The ANOVA obtained a significant main effect for diagnostic categories ($p<.001$), but no significant main effect for group and no significant interactions between group by diagnostic category. Means for the learning disabled, the average, and the gifted were

16.1, 18.6, and 24.6, respectively. Tukey's multiple comparison indicated that the learning disabled and the average group were not significantly different from each other, whereas the learning disabled group and the average group were different from the gifted group.

Table 9

Grade 7 Phase 1 Subjects

		Learning Disabled	Average	Gifted
Number of Subjects				
I.E.	Initial	42	45	43
	Final	36	39	38
Control	Initial	32	30	23
	Final	27	22	15
Canadian Achievement Tests: Reading Performance				
I.E.	Mean	4.07	7.20	11.56
	SD	0.86	0.93	1.10
Control	Mean	3.87	7.26	11.51
	SD	0.78	1.10	1.63
Canadian Achievement Tests: Math Performance				
I.E.	Mean	6.17	6.96	9.44
	SD	1.12	1.50	1.02
Control	Mean	6.17	7.13	9.81
	SD	1.33	1.06	1.25
Canadian Cognitive Abilities Test: Verbal Ability				
I.E.	Mean	93.9	102.2	120.3
	SD	11.0	13.2	7.9
Control	Mean	92.1	101.8	124.8
	SD	11.8	9.5	8.6

Table 9 (continued)

Grade 7 Phase 1 Subjects

		Learning Disabled	Average	Gifted
Canadian Cognitive Abilities Test: Nonverbal Ability				
I.E.	Mean	97.3	101.1	121.4
	SD	9.5	8.4	9.6
Control	Mean	96.4	99.7	123.2
	SD	8.5	8.9	10.9
Behavioral Rating Scale: Learning				
I.E.	Mean	13.4	17.4	24.9
	SD	5.5	6.1	4.9
Control	Mean	10.7	13.0	20.5
	SD	4.0	5.3	6.3
Behavioral Rating Scale: Motivation				
I.E.	Mean	16.5	19.7	26.6
	SD	5.5	6.1	4.9
Control	Mean	13.9	15.6	20.2
	SD	3.7	5.8	7.5
Behavior Rating Scale: Creativity				
I.E.	Mean	17.3	20.1	26.9
	SD	6.2	6.0	6.3
Control	Mean	14.5	15.4	22.1
	SD	6.2	6.5	8.4

Subject Attrition (Phases 1 and 2)

It can be seen from the tables presented in the previous sections that some subjects were lost during the process of program implementation. Although student attrition was a definite factor, the number of students who, at the end of the project, had all three tests points for any one variable, was adequate for meaningful statistical analyses. Table 10

(I.E., S.P.E.L.T, Control) and student group (learning disabled, average and gifted). However, for any one particular dependent variable, such as locus of control or reading, the number of students having complete data for all tests points varied, with no individual cell having less than fifteen students.

The subject attrition was generally due to the following factors: the subject had moved, the school could not implement the program due to teacher transfer, illness or time/budget constraints. Subjects also may not have had all test points due to being absent during the testing period, having completed only some of the subtests or having errors in test administration.

Table 10

Student Retention

Grade 4	Learning Disabled	Average	Gifted
I.E.			
Initial	65	56	49
Final	38	44	43
Retention	.58	.79	.88
S.P.E.L.T.			
Initial	52	62	54
Final	33	45	37
Retention	.63	.73	.69
CONTROL			
Initial	39	60	48
Final	27	41	38
Retention	.69	.68	.79

Table 10 (continued)

Grade 7	Learning Disabled	Average	Gifted
I.E.			
Initial	57	38	41
Final	38	28	27
Retention	.67	.74	.66
S.P.E.L.T.			
Initial	40	38	46
Final	24	29	39
Retention	.60	.75	.85
CONTROL			
Initial	72	69	40
Final	50	49	30
Retention	.69	.71	.75

Chapter Summary

The randomization procedure utilized during Phase 1 appears to have worked well. At grade 4 no significant differences were observed for the conditions. The grade 7 students were differentiated by teacher ratings of motivation with I.E. students being rated somewhat higher than control students. These results may be due to the sensitivity to individual differences of students, for teachers who had already experienced part of the inservicing prior to filling out the rating scale. No other real significant difference was evident between experimental groups.

The problem of subject attrition was also discussed. It was argued that although student attrition was a definite factor, the number of students at the end of the project was adequate for meaningful statistical analyses because for any one particular dependent variable, no individual cell was less than fifteen students. In Part Three, the results of the study are reported.

PART THREE - RESULTS

Part Three contains the final three chapters of the study. The results concerning program effects are described in Chapter 7. Participants' perceptions about the study are specified in Chapter 8, with summary, conclusions and recommendations presented in the final chapter.

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Chapter 7

RESULTS OF THE STUDY

This chapter presents the results of the study. The results are discussed in terms of the effects of the two cognitive education programs and traditional instruction in four major areas: cognitive ability, academic achievement, affective perceptions, and cognitive strategies.

The major analyses reported here were two-way ANOVAs with the first factor being experimental group (I.E., S.P.E.L.T., Control) and the second, a repeated factor, being the testing periods. With respect to the group measures of affect and achievement, the three time periods were pre-test, post-test at conclusion of instruction and post-test at the end of maintenance. With the cognitive ability analyses there were only two time periods, pre-test and post-test at the end of maintenance. The cognitive strategies as indicated in an earlier section of this report, involved a post-test only design with post-test after one year of instruction, post-test after two years of instruction and post-test after maintenance.

In the following sections the results are reported first for the three groups (learning disabled, average and gifted) at grade 4 and then for these three groups at grade 7. ANOVA results tables are in Appendix F. Results with significant findings are reported in the text. The important effects to focus on cognitive ability, achievement, and affect are group-by-time interactions as these provide evidence of program effects. The important effects to focus on for the cognitive strategy measures are main effects for group, and group-by-time interactions. A summary of means and standard deviations for all tests conducted is in Appendix E.

Grade 4 Results

Grade 4 Learning Disabled

Cognitive Abilities

Three ANOVAs were carried out utilizing verbal, quantitative, and non-verbal standard scores from the CCAT as the dependent measures. There were no significant program effects observed for verbal or non-verbal ability as no significant group-by-time interactions were obtained. However, a significant interaction was obtained for quantitative ability (F=4.11, df=2,85, p=.02). This interaction is somewhat difficult to interpret as S.P.E.L.T., I.E. and control subjects all decrease in quantitative scores from the first year to the third year. However, controls displayed a slight decrease of 1.3 points, S.P.E.L.T. and I.E. groups indicated 6.5 and a 3.5 point decrease respectively. This may indicate a regression to the mean phenomenon as the change is not very large and the initial means of the three groups were 101.0, 98.0 and 93.0 for I.E., S.P.E.L.T. and control, respectively. There was also a significant main effect for group (F=3.76, df=2,86, p=.027) with respect to verbal ability. The means over time for I.E., S.P.E.L.T. and Control are 94.2, 96.3 and 89.7 respectively. The differences are small. Scheffé's test indicated that S.P.E.L.T and control students differed (P=.047). However, I.E. did not significantly differ from the other two groups. The difference is quite small between S.P.E.L.T. and control students (6.6 points) and thus is probably not a significant factor contributing to group differences on other variables. At maintenance the mean difference is only 3.2 points.

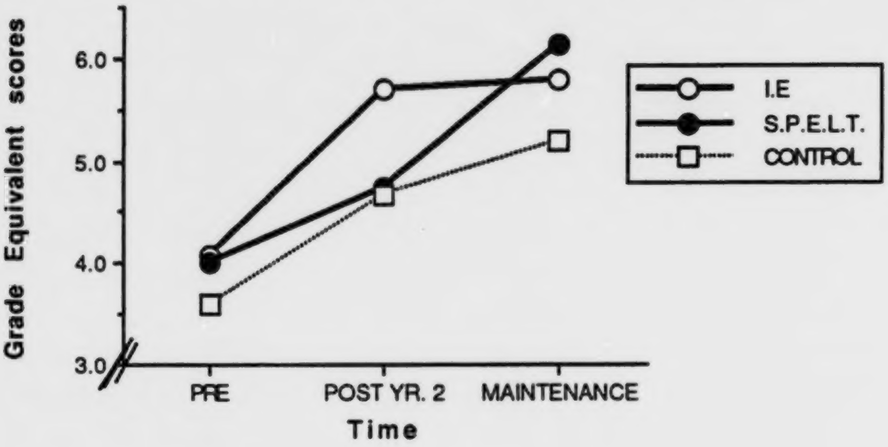
Academic Achievement

Four ANOVAs were carried out using reading comprehension, vocabulary, math concepts and application, and math computation grade scores from the CAT as the dependent variables. There were no program effects observed for vocabulary or computation. However, significant interaction effects were obtained for math concepts and application (F=3.28, df=4,140, p=.01). Figure 3 depicts the interaction effect obtained.

From Figure 3 it appears that I.E. students at the end of the two years of cognitive instruction outperformed both S.P.E.L.T. and Control. After the one year maintenance period both S.P.E.L.T. and I.E. students outperformed the Controls. There was, however, little gain during the maintenance year for Control students.

Figure 3

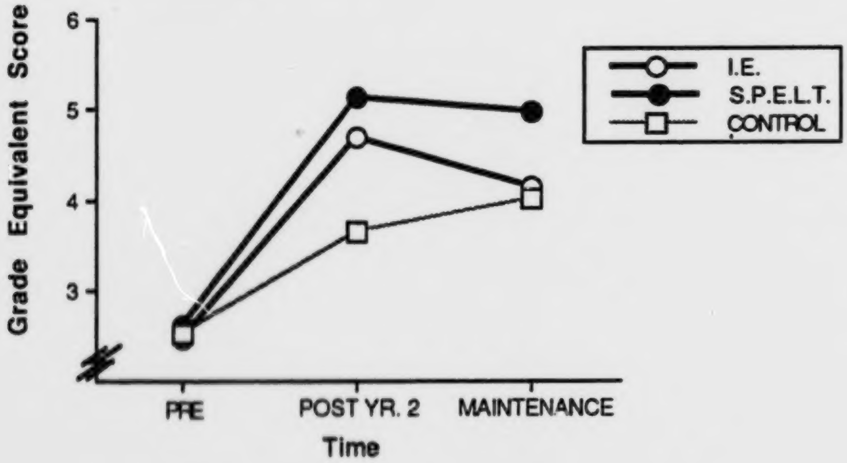
Math Concepts & application: Grade 4 learning disabled



With respect to reading comprehension there was an obvious trend observed for an interaction of groups and time (F=2.3, df=4,138, p=.065). Figure 4 displays this interaction.

Figure 4

Reading Comprehension: Grade 4 learning disabled



It is obvious from Figure 4 that both I.E. and S.P.E.L.T. students appeared to display greater gains in reading comprehension grade scores after two years of cognitive instruction, when compared to their control counterparts. However, I.E. appeared to regress during the maintenance period, performing at essentially the same level as controls by the end of the three-year period. S.P.E.L.T. students, on the other hand demonstrated little, if any, change during the maintenance period and after three years of instruction were performing almost one grade level higher than both I.E. and Control students.

Affective Perceptions

Perceived Competence

An ANOVA was conducted utilizing cognitive, social, physical and general subscale scores from the Harter scale, as the dependant variables. No significant program effects were evident for cognitive, physical, social or general perceived competence, as no significant interactions were obtained for group-by-time on any of the four measures. It appears therefore that the perceived competence of the learning disabled student was unaffected over the long term by cognitive education programming.

Self Concept

Two ANOVAs were carried out using school and general self-concept scores from the *Coopersmith Self-Esteem Inventory* as the dependent variables.

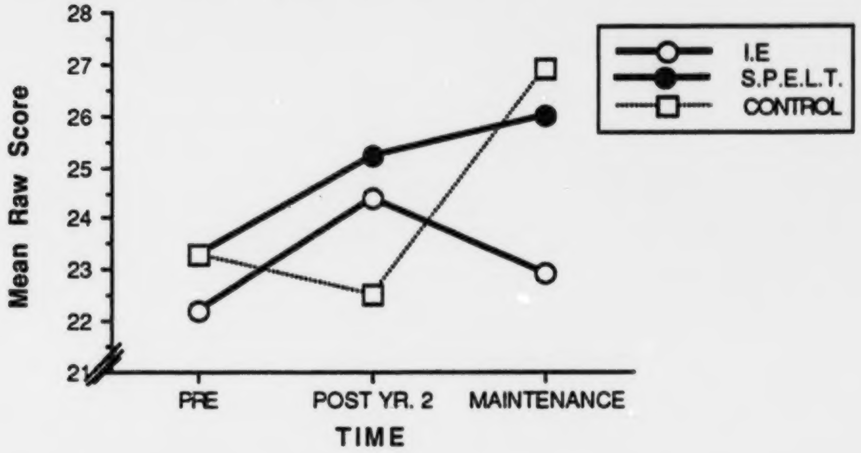
There were no significant group-by-time interactions obtained for either of the two variables. It thus appears that these two cognitive education programs had no effect on grade 4 learning disabled students' school or general self concept over a three year period. There was a significant group main effect for school (F=3.54, df=2,80, p=.034). The means over time for I.E., S.P.E.L.T. and Control were 4.47, 5.36, and 4.91 respectively. A significant group main effect was also observed with respect to general self-concept (F=4.78, df=2,80, p=.011). The means over time for I.E., S.P.E.L.T. and Control were 15.87, 17.83 and 18.90 respectively. Controls performed at higher levels than the other two groups. This was particularly evident at pretest.

Locus of Control

One ANOVA was conducted utilizing internal scores from the IARQ as the dependent variable. A significant two-way interaction was observed for internal (F=3.17, df=4,140, p<.016). Both I.E. and S.P.E.L.T. increased in overall internal locus of control after two years of cognitive education, whereas the Controls became more external. However, after maintenance both S.P.E.L.T. and Control displayed greater levels of internal control compared to I.E. which decreased in degree of internal locus of control during the maintenance year (see figure 5).

Figure 5

Internal Locus of Control: Grade 4 learning disabled



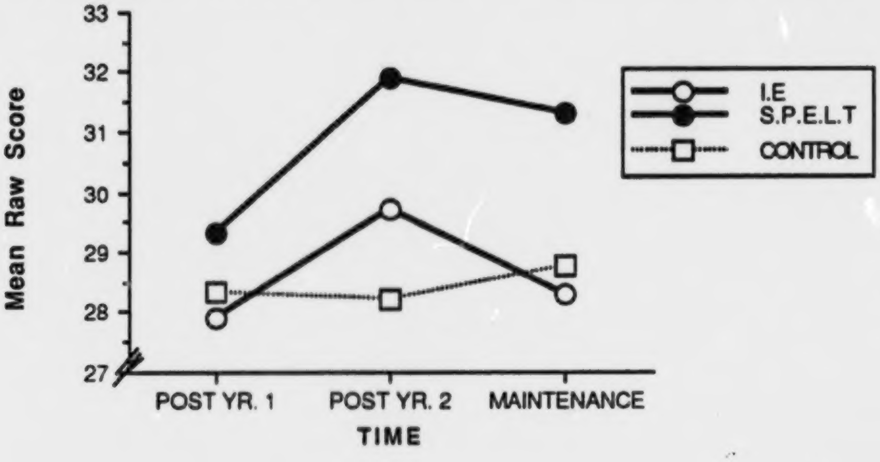
Cognitive Strategies

Metacognitive Reading Awareness

The total reading strategy awareness scores from the *Paris Reading Awareness Questionnaire* obtained were subjected to an ANOVA. A significant main effect (F=3.47, df=2,64, p=.037) was obtained, however, there was no significant group-by-time interaction. The significant main effect appears due to the higher levels by both I.E. and S.P.E.L.T. students at the end of the two years of cognitive education, with S.P.E.L.T. students tending to hold this higher level of performance after maintenance and I.E. dropping back to the same level of performance as the Controls (see Figure 6).

Figure 6

Metacognitive Reading Awareness: Grade 4 learning disabled



The overall means for I.E., S.P.E.L.T. and Control were 28.8, 31.2, and 28.5 respectively. This pattern of performance follows the trend obtained for the standardized reading comprehension results reported earlier.

Reading Cloze Performance

Two ANOVAs were carried out utilizing the number of **synonyms** or **absolutely correct words** from the *Cloze Task*, as the two dependent measures. With respect to the number of **synonyms** chosen, a trend towards a significant group-by-time interaction was observed (F=2.32, df=4,144, p=.059). See Figure 7 for a graphic representation of this interaction. The group-by-time interaction appears due to higher level of performance by the S.P.E.L.T. students on the posttest point at the maintenance period. The S.P.E.L.T. students appeared to make better use of context in comprehending material as compared to I.E. and Control students.

Figure 7
Cloze (Synonyms): Grade 4 learning disabled

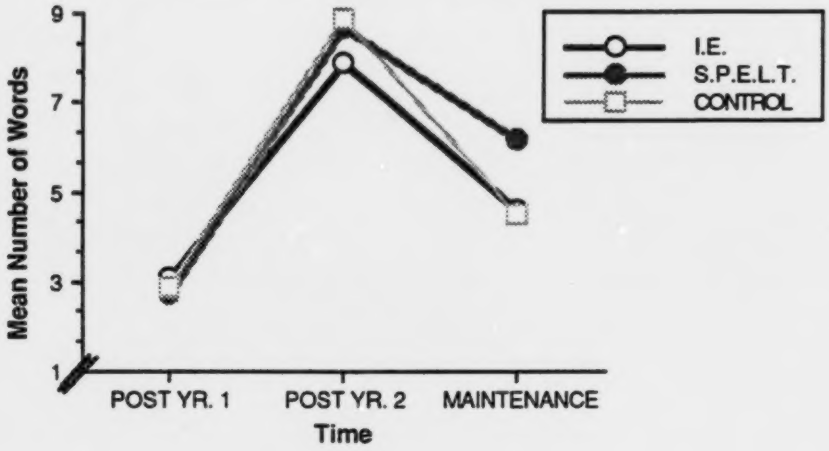
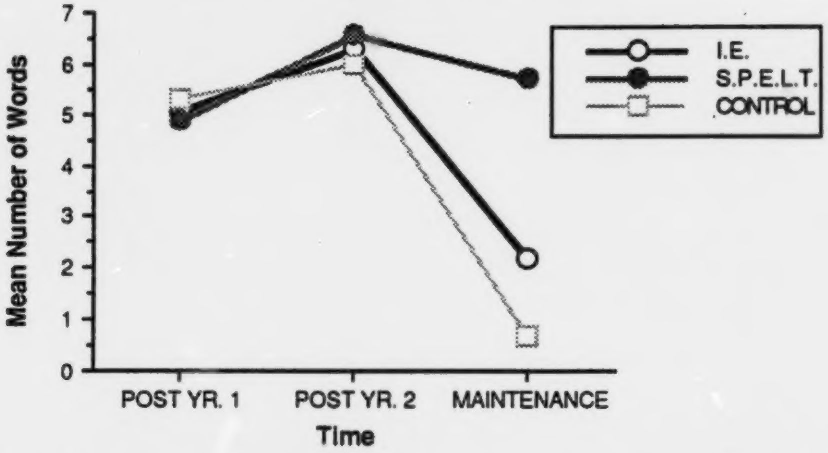


Figure 8
Cloze (Correct): Grade 4 learning disabled



A significant group-by-time interaction was also observed with respect to absolute correct words chosen (F=10.98, df=4,144, p=.001) (see Figure 8). A significant group main effect was also obtained (F=6.20, df=2,72, p=.003). The interaction appeared due mainly to the performance of the S.P.E.L.T. students as compared to I.E. and Control students, particularly at the end of maintenance year. Both S.P.E.L.T. and I.E. appeared to do better than the Control group. S.P.E.L.T. students appeared to perform at higher levels at the end of maintenance than both I.E. and Control students.

Comprehension Monitoring

Two ANOVAs were carried out using the number of errors correctly identified in each of the two different stories of the *Error Detection Task* as the dependent variables. With respect to the story at the students' approximate instructional level there were no effects observed. For the more difficult story (story 2) there was a trend towards a significant group main effect (F=2.78, df=2,68, p=.069) although no interaction was evident. The overall means over the three test points for I.E., S.P.E.L.T. and Control were 1.6, 2.2, and 1.7, respectively. There is some indication that S.P.E.L.T. may affect the comprehension monitoring ability of grade 4 learning disabled students.

Perceived Problem Solving Ability

A one-way ANOVA at the end of the maintenance year, utilizing total perceived problem solving raw scores from the *Perceived Problem Solving Inventory*, as the dependent variable, was carried out. The results indicated no significant differences between the three groups. The means for I.E., S.P.E.L.T. and Control students were 99.3, 100.4, and 98.00 respectively. The two cognitive education programs appeared to have little effect on the perceived problem solving ability of grade 4 learning disabled students after three years.

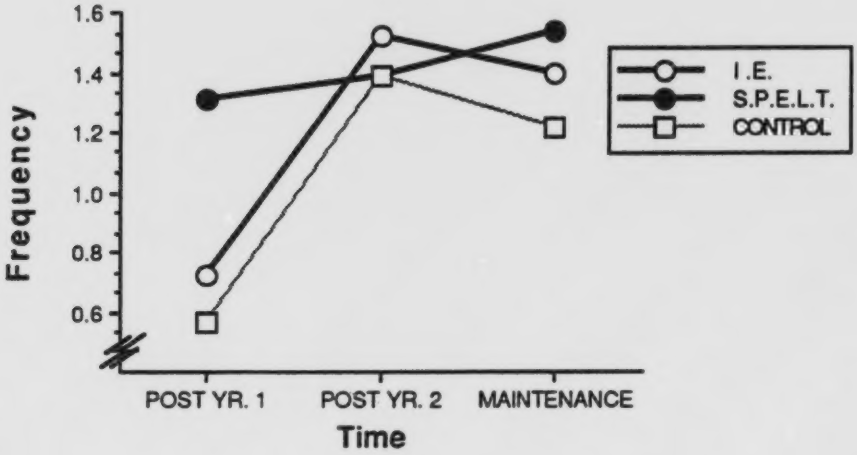
Math Problem Solving Strategies

Six ANOVAs were carried out to determine if the frequency of use of a particular strategy (**rereading, stating plans, determining reasonableness of an answer, guessing and checking, using manipulatives**, or **determining alternatives**), from the strategy assessment: math problems would differentiate the three groups of students.

The results with respect to utilization of a **rereading** strategy indicated no statistically significant group main effect or group-by-time interaction. However, a trend towards a significant group main effect was evident (F=2.7, df=2,58, p=.073). The overall means over time for I.E., S.P.E.L.T., and Control students were 1.2, 1.4, and 1.1 respectively. Figure 9 displays the group means over time.

Figure 9

Math Strategy (Rereading): Grade 4 learning disabled



There was a tendency for S.P.E.L.T. students to generally make more use of the **rereading** strategy in solving math problems as compared to both I.E. and Control students. This is most evident after one year of instruction and at the end of maintenance. This strategy is part of most problem solving models as the initial step in defining the problem. S.P.E.L.T. students appear to have used this strategy more consistently over the three years as compared to I.E. and Control students.

With respect to **stating plans** the group-by-time interaction was not significant. However, the group main effect did reach significance (F=5.92, df=2,60, p=.005). The overall means over time for I.E., S.P.E.L.T. and Control students were .13, .54, and .25 respectively. It is apparent that S.P.E.L.T. students, overall, made greater use of the **stating a plan** strategy than I.E. and Control students.

The frequency of the **using manipulatives** strategy did not differentiate between the three groups of students as neither the group main effect nor the group-by-time interaction were significant.

There were no significant group main effects or group-by-time interactions obtained with respect to the frequency of using a **guessing and checking** strategy. The same was found for the strategies of looking for **alternative ways of solving the problem** and **checking the reasonableness of one's answer.**

In summary the S.P.E.L.T. students demonstrated greater use of the **rereading** and **stating plans strategies** when solving math problems as compared to both I.E. and Control students.

Synopsis of Results

For perceived competence and self-concept there were no significant program effects observed. However, experimental effects were observed for locus of control. The S.P.E.L.T. and I.E. students displayed an increase in overall internal locus of control after the two years of instruction. With respect to academic achievement, the most pervasive experimental effects were observed for reading. The reading comprehension performance of both I.E. and S.P.E.L.T. students improved at the end of program implementation. However the effect was diminished after the maintenance period, particularly for I.E. students. At the end of maintenance S.P.E.L.T. students, in contrast, performed approximately one grade above both Control and I.E. students. The standardized reading achievement changes were coupled with changes in related areas of reading, most notably, in metacognitive reading awareness and to a lesser extent, in cloze performance and comprehension monitoring. These related effects were more consistently observed for S.P.E.L.T. students which might be expected, as many of the reading strategies taught in the program are more directly related to reading tasks than are those in the I.E. program.

The math problem solving skills of the I.E. and S.P.E.L.T. students displayed some indication of impact as both groups increased performance over Controls at the end of the maintenance year. This was coupled with some changes in frequency of math strategies used in solving individual problems. This was particularly true for the S.P.E.L.T. students who displayed greater use of both the **reread** strategy and **stating a plan** strategy.

The general effects reviewed above provide a reasonably optimistic picture regarding the impact of learning/thinking strategy teaching for students with learning difficulties in regular classrooms.

Grade 4 Average Achieving

Cognitive Abilities

Three ANOVAs using verbal, non-verbal, and quantitative scale scores from the *CCAT* as the dependent measures were carried out. No significant group effects and no significant group-by-time interactions were evident for verbal, non-verbal, and quantitative abilities. Therefore, the groups were performing at essentially the same level on all three measures at both pre- and post-test.

Academic Achievement

Four ANOVAs were conducted using reading comprehension, reading vocabulary, math concepts and application, and math computation grade scores from the *CAT* as the dependent measures.

For math computation, math concepts and application, or reading vocabulary no significant interactions were obtained. The reading comprehension performance for the three groups displayed the same general pattern observed for the learning disabled. However, the interaction term failed to reach significance.

Affective Perceptions

Perceived Competence

Four ANOVAs were carried out utilizing social, cognitive, physical and general scores from the *Harter Perceived Competence Scale* as the dependent measures.

There were no significant program effects observed for cognitive, social, physical or general subscales. No significant interactions of group-by-time were observed for any of the four variables. The cognitive instruction appears to have no effect on grade 4 average achieving students' perceived competence as measured by this particular instrument. There was however a significant group main effect evident for social (F=3.14, df=2,87, p=.048). The means over time for I.E., S.P.E.L.T. and Control were 2.86, 3.02, and 2.72 respectively. The effect appears due mainly to the increased level of S.P.E.L.T. students compared to the two groups after two years of instruction which is maintained at final post-test. The interaction however did not reach significance. A main effect for group was also obtained with respect to general perceived competence (F=3.32, df=2,91, p=.041). The means over time for I.E., S.P.E.L.T. and

Control were 2.94, 3.04, and 2.80, respectively. The main effect is due to the overall higher levels of experimental subjects as compared to controls.

Self Concept

Two ANOVAs were carried out using school and general self-concept raw scores from the *Coopersmith Self-Esteem Inventory* as the dependent variables.

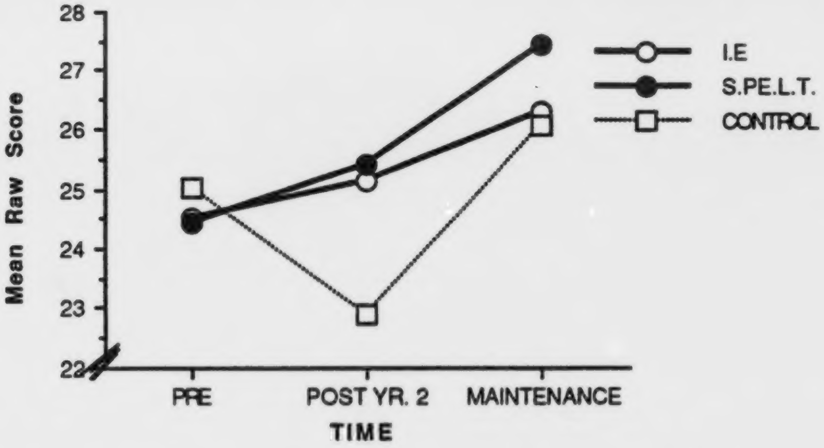
There were no significant group-by-time interactions evident for either of the two aspects of self concept. It thus appears that the two cognitive education programs do not affect the school or general self concept of grade 4 average achieving youngsters after two years of instruction.

Locus of Control

One ANOVA utilizing the internal locus of control score from the *IARQ* as the dependent variable was conducted. A significant group-by-time interaction was obtained for degree of internal locus of control (F=2.44, df=4,194, p=.048). Figure 10 displays the interaction.

Figure 10

Internal Locus of Control: Grade 4 average students



It appears that the interaction is due mainly to a decrease in internal locus of control by the Control students from pre-test to the end of two years of instruction. I.E. and S.P.E.L.T. students displayed slight increases in internal scores. At the end of the full three years, however, the three groups appeared to be essentially the same.

Cognitive Strategies

Metacognitive Reading Awareness

An ANOVA was carried out utilizing the reading awareness total scores from the *Paris Reading Awareness Questionnaire* as the dependent variable.

The group-by-time interaction was not significant, however, a significant group main effect was observed (F=5.38, df=2,89, p=.006). The overall means for I.E., S.P.E.L.T. and Control students were 30.4, 32.9, and 29.2 respectively. Scheffé's comparisons of unweighted main effects indicated that S.P.E.L.T. and Control students were significantly different from each other however, I.E. students were not significantly different from either S.P.E.L.T. or Control students. Cognitive education instruction appeared to have an effect on the metacognitive reading awareness skills of grade 4 average achieving students particularly in a content-based program such as S.P.E.L.T.

Reading Cloze Performance

Two ANOVAs were carried out using the number of **synonyms** and **absolutely correct words** from the *Cloze Task* as the dependent variables.

The results indicated no significant main or interaction effects. However, the general mean trends, particularly after two years of instruction, follow that obtained for the metacognitive reading strategies awareness measure. The mean number of synonyms chosen for I.E., S.P.E.L.T., and Control after two years instruction, were 6.55, 6.65 and 5.68 respectively. Whereas after one year the means for I.E., S.P.E.L.T. and Control were 7.07, 8.05, 7.70 respectively. At the end of maintenance, the means were essentially the same (7.4, 7.6, 7.6).

Comprehension Monitoring

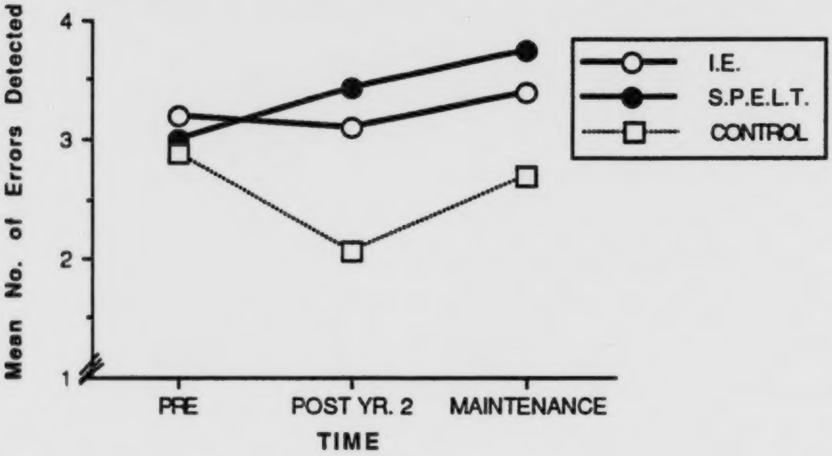
Two ANOVAs were conducted utilizing the number of errors detected for each of the two stories from the *Error Detection Task* as the dependent variables.

A significant group main effect was observed with respect to the number of errors detected by the three instructional groups for the story given at approximate instructional level (F=3.5, df=2,66, p=.036). The overall means over time for I.E., S.P.E.L.T., and Control students were 3.2, 3.4, and 2.6 respectively. The main effect appears due to the higher levels of errors detected by both I.E. and S.P.E.L.T. students after two years of instruction as well as at the end of maintenance (see Figure 11).

The results with respect to the story given at students' approximate frustration level, indicate no significant program effects since neither the group main effect, nor the group-by-time interaction reached significance.

Figure 11

Comprehension Monitoring: Grade 4 average students



Perceived Problem Solving Ability

A one-way ANOVA was carried out using the perceived problem solving total raw scores from the *Perceived Problem Solving Inventory* as the dependent variable. The results indicated no significant differences between I.E., S.P.E.L.T. or Control. The means for I.E., S.P.E.L.T., and Control were 103.4, 102.6, and 101.5 respectively. The two cognitive education programs did not appear to affect the perceived problem solving ability of grade 4 average students after the three years.

Math Problem Solving Strategies

The frequency of using each of the six strategies **rereading, stating plans, guessing and checking, using manipulatives, determining the reasonableness of an answer,** and **determining alternative ways of solving a problem** from the strategy assessment in math problems was subjected to ANOVAs.

The frequent use of the **rereading** strategy did differentiate the three groups as a significant group main effect was obtained (F=3.08, df=2,93, p=.05). The group-by-time interaction, however, did not reach significance. The overall means over time for the I.E., S.P.E.L.T., and Control students were 1.10, 1.35, and 1.06 respectively. The S.P.E.L.T. students, overall, displayed a greater frequency of usage of the **rereading** strategy than I.E. and Control students.

With respect to the strategy of **stating plans** a significant group main effect (F=4.02, df=2,93, p=.021) as well as a group-by-time interaction (F=3.66, df=4,186, p=.007) was obtained. Figure 12 displays the means of the three groups over time.

The interaction appears due to the behavior of the S.P.E.L.T. students. After one year of instruction S.P.E.L.T. students displayed a higher frequency of use of the strategy than I.E. and Control students and this remained over the three years.

With respect to the strategy of **using manipulatives**, a significant group-by-time interaction was also obtained (F=3.20, df=4,186, p=.014). Figure 13 displays the group means of the three groups over time. The interaction appears mainly due to the differences between the two experimental groups after two years of instruction and after the maintenance year. The two experimental groups displayed less use of the strategy after maintenance as compared to the control group.

Figure 12

Math Strategy (Stating Plans): Grade 4 average students

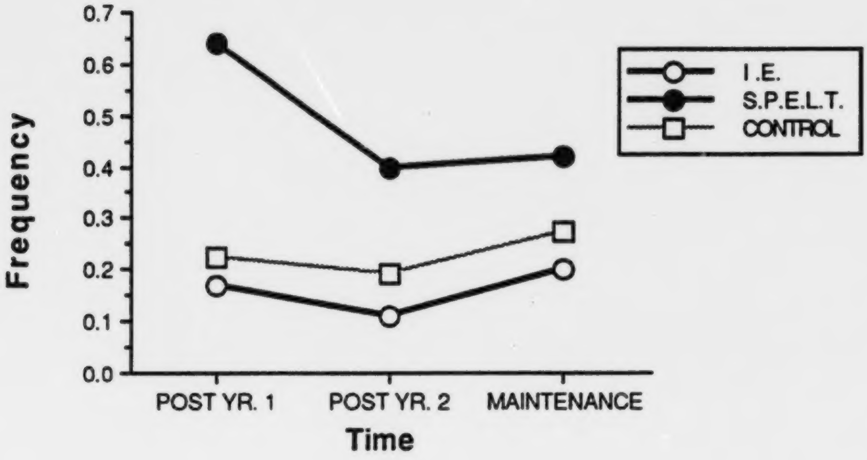
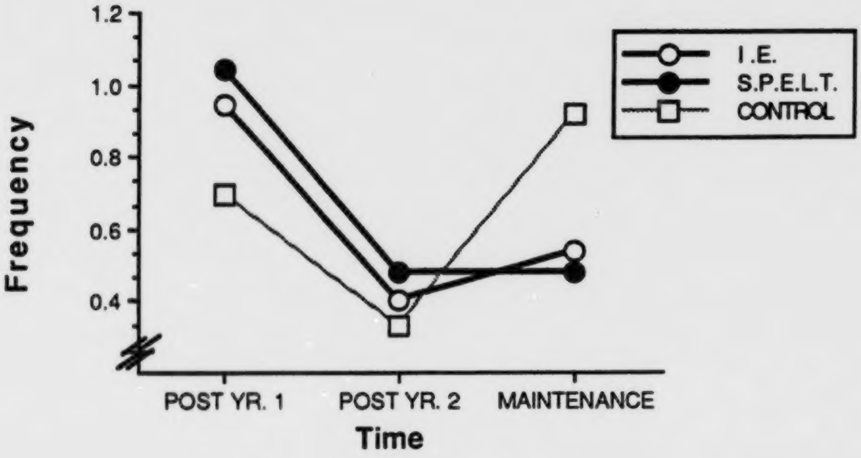


Figure 13

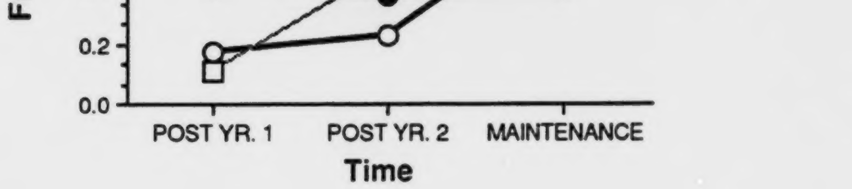
Math Strategy (Using Manipulatives): Grade 4 average students



The frequency of use of the strategy of **guessing and checking** also differentiated the three groups, as a significant group-by-time interaction was obtained. (F=4.39, df=4,186, p=.002). Figure 14 displays the group means over time.

Figure 14

Math Strategy (Guessing & Checking): Grade 4 average students



The effect appears due to the behavior of the Control and I.E. students who increased use of this strategy over time. This is particularly obvious for the Control students. S.P.E.L.T. students started with a higher frequency of use after one year of instruction and maintained, essentially, the same frequency level over the three years.

No significant differences were obtained with respect to the frequency of use of the strategies of **determining alternative ways of solving the problems** and **determining the reasonableness of an answer.**

Synopsis of Results

As was the case for the grade 4 learning disabled students, little if any effects, were observed with respect to self concept and perceived competence. There were, however, experimental effects obtained with respect to locus of control. After the two years of instruction both S.P.E.L.T. and I.E. students displayed a greater degree of internal locus of control.

The metacognitive reading awareness skills as well as the comprehension monitoring skills of S.P.E.L.T. students appeared to be significantly enhanced with I.E. students displaying increased skill only in comprehension monitoring as compared to controls. With respect to academic achievement, no significant program effects were observed. However, differences were observed between groups in the frequency of using different strategies, particularly in rereading, stating plans, using manipulatives and guessing and checking.

Grade 4 Gifted

Cognitive Abilities

Three ANOVAs were carried out utilizing verbal, non-verbal, and quantitative scale scores from the *CCAT* as the dependent measures.

A significant group-by-time interaction was obtained for verbal ability (F=4.50, df=2,111, p=.013). The mean change for pre-test to post-test for I.E., S.P.E.L.T. and Control students was 12.2, 4.2 and 7.8 respectively. All groups regressed towards the population mean with I.E. and Control students displaying greater change. The pre-test to post-test means were 124-112, 124-120, and 128-120, for I.E., S.P.E.L.T., and Control respectively. An interaction was also evident for non-verbal ability (F=3.00, df=2,110, p=.054). The same change was evident. All three groups regressed to low levels of non-verbal ability at maintenance. The pretest to postest means were 122-110, 123-117, 122-114 for I.E., S.P.E.L.T. and Control respectively.

Academic Achievement

Four ANOVAs were conducted using reading comprehension, reading vocabulary, math concepts and application, and math computation grade scores from the CAT as the dependent variables. There were no significant program effects observed for any of the four academic measures.

Affective Perceptions

Perceived Competence

Four group ANOVAs were carried out using perceived competence raw scores from the *Harter Perceived Competence Scale* for cognitive, social, physical and general subscales as the dependent variables. The results indicated no significant main effect or group-by-time interaction effects for any of the four perceived competence variables. The two cognitive education programs did not significantly affect the perceived competence of grade 4 gifted students over three years.

Self Concept

Two ANOVAs were carried out utilizing school and general self-concept raw scores from the *Coopersmith Self-Esteem Inventory* as the dependent measures.

As was the case for the average and learning disabled students no significant interactions were obtained for either of the two self concept variables. Thus the two cognitive education programs did not appear to affect grade 4 gifted students' school and general self concept over three years.

Locus of Control

One ANOVA was carried out using internal locus of control, raw scores from Crandall's *IARQ* as the dependent variable. The results indicated no significant group effects for overall internal locus of control.

Cognitive Strategies

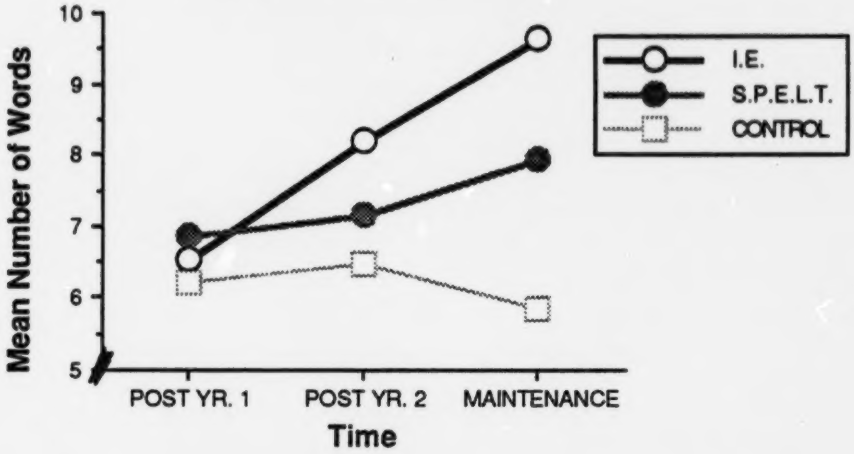
Metacognitive Reading Awareness

An ANOVA was carried out utilizing metacognitive reading awareness total scores from the *Paris Reading Awareness Questionnaire* as the dependent variable. The group-by-time interaction did not reach significance, however, a trend towards a main effect (F=2.78, df=2,85, p=.068) was observed. The means for I.E., S.P.E.L.T. and Control were 32.5, 32.8, 31.0 respectively. This follows the pattern of results obtained for the learning disabled and average achieving students.

Reading Cloze Performance

Two ANOVAs were carried out utilizing the number of synonyms and correct words from the *Cloze Task* as the dependent variables. A significant main effect for group (F=13.62, df=2,98, p=.001) as well as a significant group-by-time interaction (F=3.88, df=4,196, p=.005) were obtained for synonyms (see Figure 15).

Figure 15
Cloze (Synonyms): Grade 4 Gifted



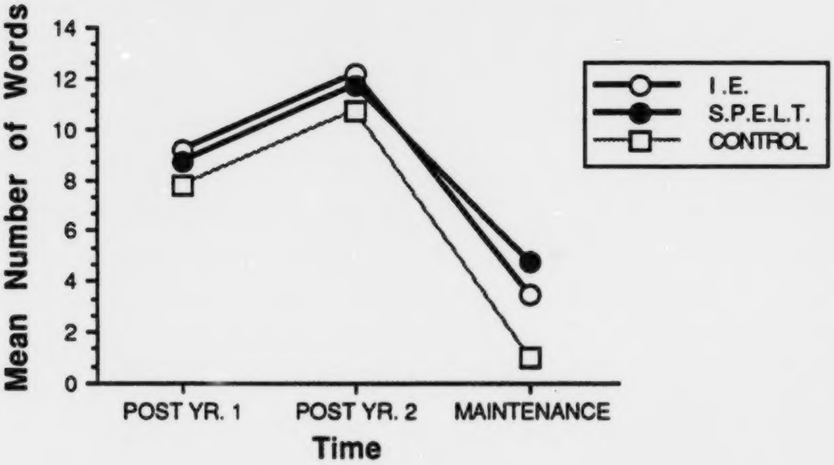
It is obvious from Figure 15 that the interaction is due to the scores obtained by I.E. students after two years of instruction and at the end of the maintenance year. I.E. students performed at higher levels than S.P.E.L.T. and Control students. Some program effects emerged at the end of the maintenance year.

With respect to correct words the same basic pattern was evident (see Figure 16). A significant main effect was obtained (F=9.31, df=2,98, p=.001) as well as a significant group-by-time interaction (F=3.47, df=2,196, p=.009).

The overall means for I.E., S.P.E.L.T., and Control were 8.3, 8.4, and 6.5 respectively. It appears from Figure 16 that both I.E. and S.P.E.L.T. students display higher levels of using context in comprehension on the measure, after one year of instruction and that this difference held over the next two years with greater differences being observed at maintenance. The story used at the end of maintenance may have been difficult, as all three groups performed relatively poorly on it.

Figure 16

Cloze (correct): Grade 4 gifted



Comprehension Monitoring

Two ANOVAs were carried out using the number of errors detected in each of two stories from the *Error Detection Task* as the dependent variable. The results indicated no significant group main effect or group-by-time interaction effects for the passage given at instructional level. However, a significant group main effect was obtained for the passage given at approximate frustration level (F=4.69, df=2,73, p=.012). No significant group-by-time interaction was observed. The overall means over time for I.E., S.P.E.L.T. and Control were 2.52, 2.95, and 2.15 respectively. It appears that both I.E. and S.P.E.L.T. significantly affected the comprehension monitoring skills of grade 4 gifted students.

Perceived Problem Solving Ability

A one way ANOVA was carried out using the perceived problem solving ability total raw scores from the perceived problem solving inventory as the dependent variable. The results indicated no significant difference between the three groups. The means for I.E., S.P.E.L.T., and Control were 104.6, 110.3 and 106.4, respectively. The two cognitive education programs did not appear to significantly affect the perceived problem solving ability of grade 4 gifted students at the end of the three years.

Math Problem Solving Strategies

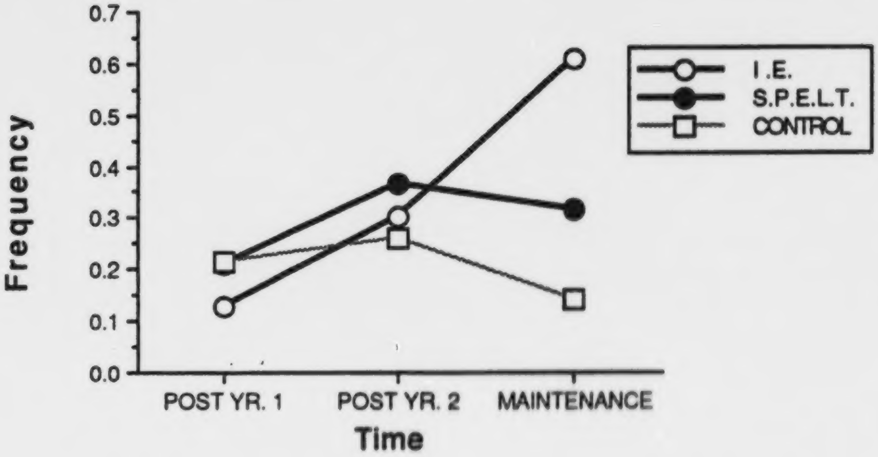
The frequency of use of the six strategies of **rereading, stating plans, guessing and checking, using manipulatives, determining reasonableness of an answer, and determining alternatives** from the strategy assessment: math problems, were each subjected to an ANOVA. The results indicated a significant group-by-time interaction with respect to the strategy of determining alternative ways of solving the problem (F=2.44, df=4,162, p=.049) as well as a significant group-by-time interaction for the strategy of determining the reasonableness of one's answer (F=3.98, df=4,162, p=.004).

It appears that both S.P.E.L.T. and I.E. students demonstrated greater use of **determining alternative ways of solving problems**, particularly at the end of maintenance (See Figure 17). This is clearly the case for I.E. students who displayed an increasing use of this strategy over time.

With respect to the strategy of **determining the reasonableness of one's answer**, the interaction appears due to the higher levels of performance of S.P.E.L.T. students after two years of instruction and at maintenance. I.E. students also demonstrated the use of this strategy after two years of instruction but, by the end of maintenance used it to a lesser degree than either Control or S.P.E.L.T. students.

Figure 17

Math Strategy (Determining Alternative Ways): Grade 4 gifted



Synopsis of Results

There were no significant program effects observed with respect to changes in student perceived competence or self concept or locus of control. There were experimental program effects evident with respect to aspects of reading performance. The reading cloze performance of both I.E. students and S.P.E.L.T. students was better than Controls, particularly by the end of maintenance. This was coupled with improved comprehension monitoring for both S.P.E.L.T. and I.E. students, as well as a trend for increased metacognitive reading awareness. Ceiling effects were observed for the standardized reading measures, thus no significant increases could be expected with respect to the standardized measure of reading. I.E. and S.P.E.L.T. students also displayed greater frequency of use of the strategy of **determining alternative ways of solving a problem**, as well as the strategy of determining the reasonableness of an answer when confronted with math word problems.

The results are promising as some changes in student performance were noted, particularly with respect to strategy measures in the area of reading comprehension and to some extent in the area of math strategies.

Grade 7 Results

Grade 7 Learning Disabled

Cognitive Abilities

Three ANOVAs were performed utilizing verbal, non-verbal and quantitative scale scores from the *CCAT* as the dependent measures. No significant program effects were observed for verbal or quantitative ability. However, a significant group-by-time interaction was obtained with respect to non-verbal ability (F=2.98, df=2,99, p<.05). The interaction appears due to an increase in non-verbal ability for the S.P.E.L.T. students as compared to I.E. and Control students who performed essentially at the same level or decrease slightly. The pre-test and post-test means for I.E., S.P.E.L.T., and Control were 98.8 and 101.3, 103.2 and 108.3, and 98.5 and 99.8, respectively.

Academic Achievement

Four ANOVAs were performed using standardized reading comprehension, reading vocabulary, math concepts and application, and math computation grade scores from the *CAT* as the dependent measures. No statistically significant program effects were observed for reading comprehension and vocabulary. However, a significant main effect for group was evident with respect to reading comprehension (F=4.64, df=2,67, p=.013). The means over time for I.E., S.P.E.L.T. and Control students were 4.74, 6.23 and 5.02 respectively. Some interesting patterns were evident for both variables (See Figures 18 and 19). Although not statistically significant, the pattern of changes favored the two experimental groups.

Figure 18

Reading Comprehension: Grade 7 learning disabled

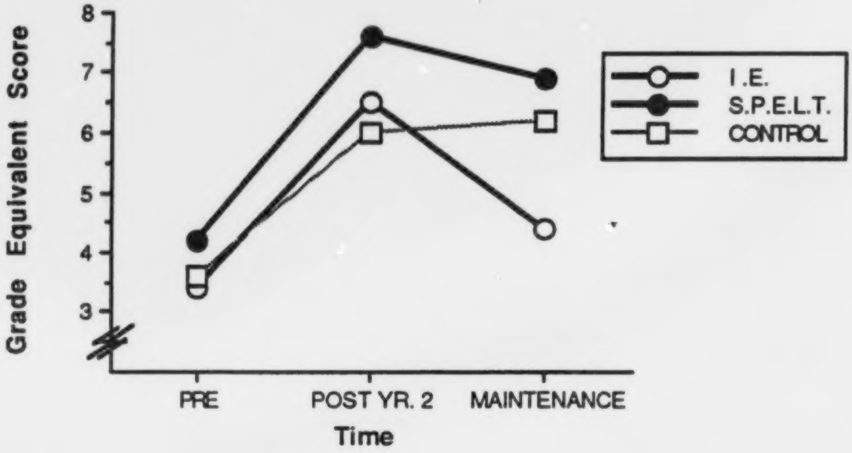
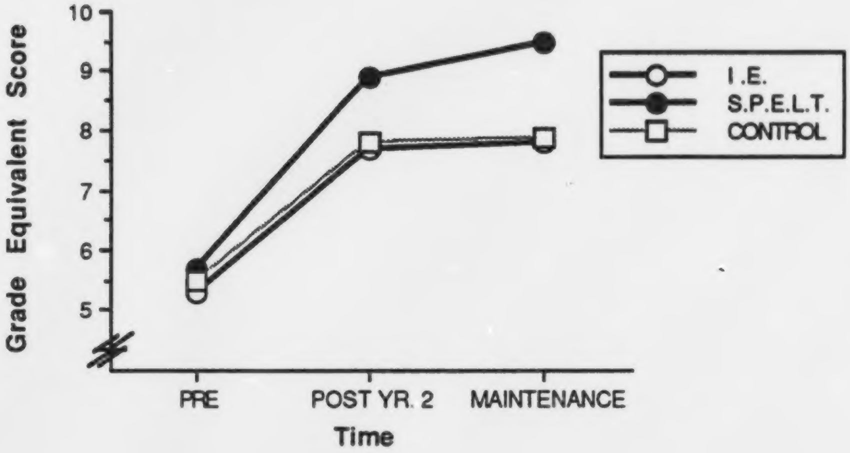


Figure 19

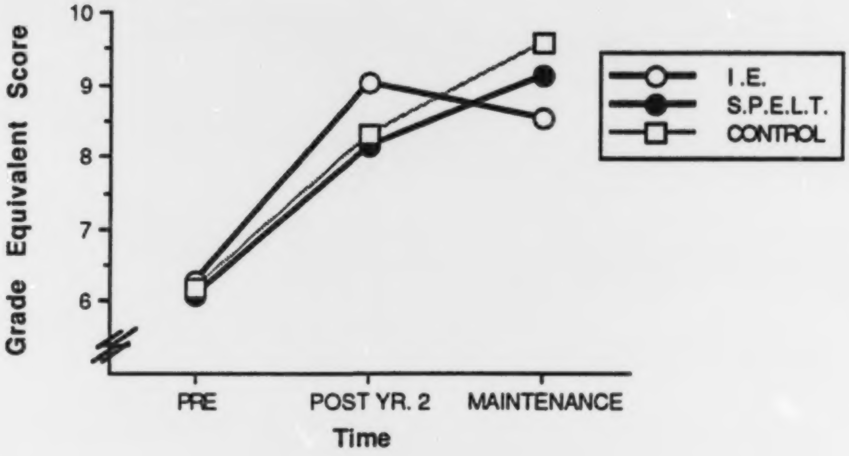
Reading Vocabulary: Grade 7 learning disabled



With respect to math computation, and concepts and application, significant group-by-time interactions were obtained for both math computation (F=2.93, df=4,134, p=.02) and math concepts and application (F=3.45, df=4,134, p=.01). Figure 20 displays the interaction with respect to math computation and Figure 21 displays the interaction for math concepts and application.

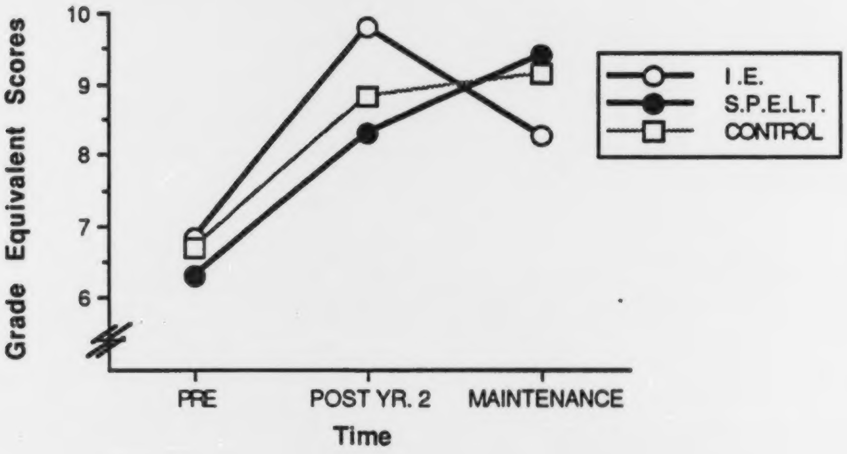
Figure 20

Math Computation: Grade 7 learning disabled



2 1

Math Concepts & Application: Grade 7 learning disabled



The math computation effect appears due to the higher levels of computation performance for I.E. students as compared to S.P.E.L.T. and Control, after the two years either S.P.E.L.T. or Control at the end of the maintenance period.

The significant interaction observed for math concepts and application appeared to follow the same pattern as that of math computation. I.E. students displayed a considerable gain in math concepts and application performance after the two years of cognitive instruction as did S.P.E.L.T. students. However, at the end of maintenance the effect for I.E. appeared to decrease.

Affective Perceptions

Perceived Competence

Four ANOVAs were carried out using cognitive, social, physical and general subscale raw scores from the *Harter Perceived Competence Scale* as the dependent measures.

No significant group-by-time interactions were obtained for cognitive, social, physical or general perceived competence. The experimental programs appear to have little effect on the perceived competence of adolescent learning disabled students over a three year period.

Self Concept

Two ANOVAs were conducted using school and general self concept raw scores from the *Coppersmith Self-Esteem Inventory* as the dependent measures. There were no significant group-by-time interactions obtained for school self concept. However, a significant group-by-time interaction was obtained with respect to general self-concept (F=2.70, df=4,154, p=.033). The interaction appeared due to the increasing general self-concept observed for I.E. students compared to both S.P.E.L.T. and Control students. Therefore, it appears that the I.E. program positively influenced the general self concept of grade 7 learning disabled students over a three year period, relative to the S.P.E.L.T. and Control.

Locus of Control

One ANOVA was carried out utilizing internal locus of control scores from Crandall's *IARQ,* as the dependent measure. With respect to overall internal locus of control there was no significant group-by-time interaction evident.

Cognitive Strategies

Metacognitive Reading Awareness

An ANOVA was carried out utilizing total scores from the *Paris Reading Awareness Questionnaire* as the dependent variable. The results indicated no significant main effect or group-by-time interactions. The pattern of means for the group, however, followed those obtained for grade 4 learning disabled students. The means for I.E., S.P.E.L.T. and Control were 32.9, 33.4 and 30.9, respectively.

Reading Cloze Performance

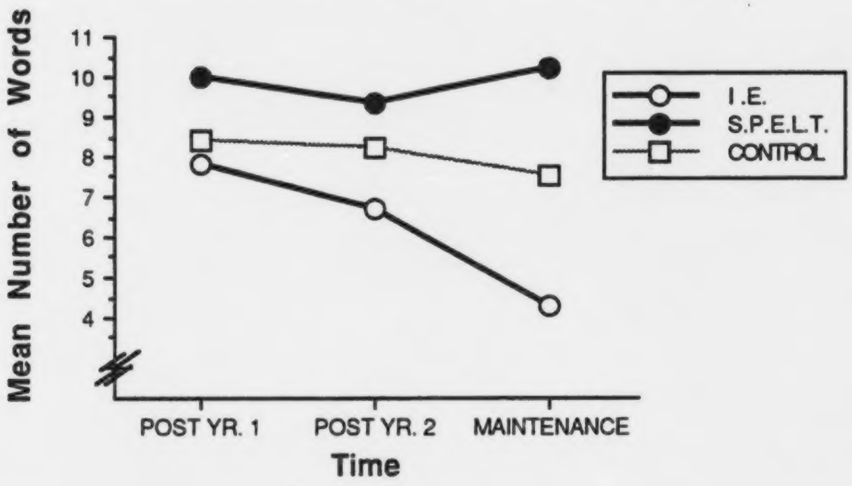
Two ANOVAs were carried out using the numbers of **synonyms** and **absolutely correct** words from the *Cloze Task* as the dependent measures.

The results for **synonyms** indicated no significant main effect for group or interaction for group and time. However, the group main effect did approach significance (F=2.96, df=2,72, p=.058). The overall means over time for I.E., S.P.E.L.T., and Control were 6.6, 7.7 and 7.4. S.P.E.L.T. students displayed a trend to use contextual strategies more efficiently than either I.E. or Control. This follows the pattern of data presented for this measure at the grade 4 level.

With respect to words which were **absolutely correct**, the group main effect (F=11.78, df=2,72, p<.001) as well as the group-by-time interaction (F=3.34, df=4,144, p=.012) were significant. The overall means for I.E., S.P.E.L.T. and Control were 6.3, 9.8, and 8.10 respectively. Figure 22 displays the group means over the three time periods.

Figure 22

Cloze (correct): Grade 7 learning disabled



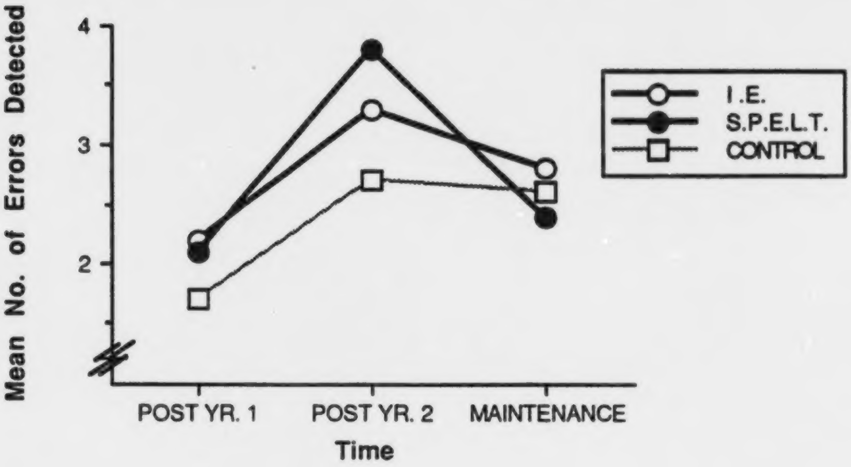
It appears that overall, S.P.E.L.T. students displayed higher levels of comprehension immediately following the first year of instruction. This also held true at the end of two years and was maintained during the last maintenance year. I.E. students, on the other hand, displayed decreasing performance over time compared to Control students.

Comprehension Monitoring

Two ANOVAs were conducted using the total number of errors detected for each of the two passages from the *Error Detection Task* as the dependent variable. The results indicated a significant main effect for group for the story given at instructional level (F=5.30, df=2,72, p=.007). The means for the three groups over time were 3.1, 3.6, and 2.7 for I.E., S.P.E.L.T, and Control students, respectively. There was also a trend towards a group-by-time interaction with respect to the story presented at approximately frustration level (see Figure 23). It thus appeared that the S.P.E.L.T. program affected the comprehension monitoring skills of grade 7 learning disabled students after two years of instruction as measured through the error detection paradigm, as compared to either I.E or control students. This difference was not evident however, at maintenance.

Figure 23

Comprehension Monitoring (Frustration Level): Grade 7 learning disabled



Perceived Problem Solving Ability

A one-way ANOVA was carried out using the perceived problem solving total raw scores from the *Perceived Problem Solving Inventory* as the dependent variable. The results indicated no significant differences between the three groups of students. The perceived problem solving ability of grade 7 learning disabled students did not appear to be affected by the two cognitive education programs, at the end of the three years.

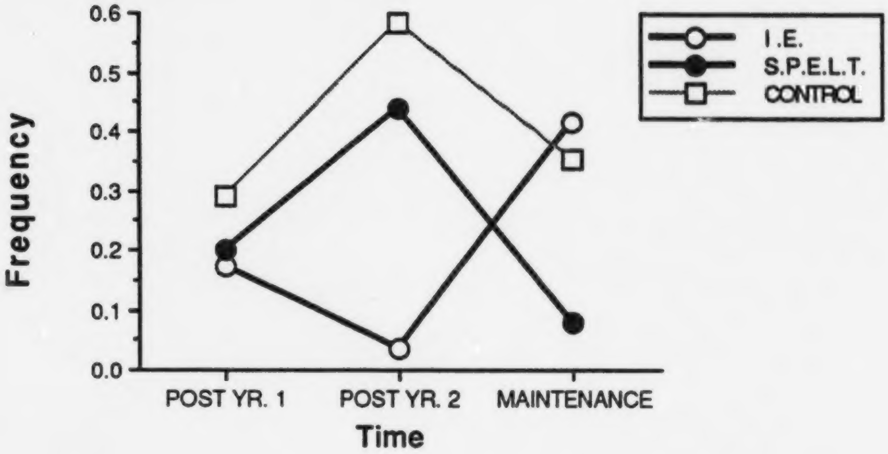
Math Problem Solving Strategies

The frequency of use of the six strategies of **rereading, stating plans, guessing and checking, using manipulatives, determining the reasonableness of an answer,** and **determining alternatives** from the math strategy problems, were each subjected to ANOVA.

The results indicated a significant group-by-time interaction with respect to the strategy of **stating plans** (F=3.14, df=4,198, p=.016) as well as a group main effect (F=3.68, df=2,99, p=.029). Figure 24 displays graphically the means of the three groups over time. The interaction appears due to the behavior of I.E. compared to S.P.E.L.T. and the Control students, after two years of instruction and at maintenance. The I.E. students displayed little use of the strategy at the end of two years of instruction but used it fairly frequently at the end of maintenance. The S.P.E.L.T. and Control students displayed essentially the opposite behavior, increasing the use during the second year, but decreasing in use during the maintenance year.

Figure 24

Math Strategy (Stating Plans): Grade 7 learning disabled

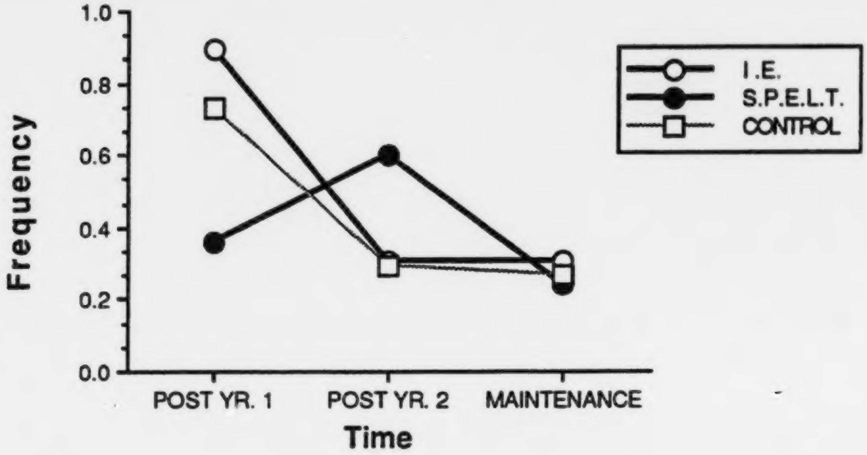


A significant group-by-time interaction was also observed with respect to the frequency of **use of manipulatives** as a strategy (F=3.29, df=4,198, p=.012). Figure 25 displays the means of the three groups over time. The effect appears due to the behavior of the S.P.E.L.T. students as compared to both I.E. and Control students. After one year of instruction the S.P.E.L.T. students made little use of the strategy compared to I.E. and Control students. However, after two years of instruction, S.P.E.L.T. students displayed a greater frequency of use of this strategy. At the end of maintenance all three groups appeared to use the strategy with roughly the same degree of frequency.

The frequency of use of the strategy of **determining alternative ways of solving the problems** did differentiate the three groups as a group main effect was observed (F=4.38, df=2,99, p=.015). The means over time for I.E., S.P.E.L.T., and Control students were .29, .29 and .13, respectively. The students in both the I.E. and S.P.E.L.T. conditions displayed greater overall use of the strategy of **determining alternative ways of solving the problems** compared to the Control students.

Figure 25

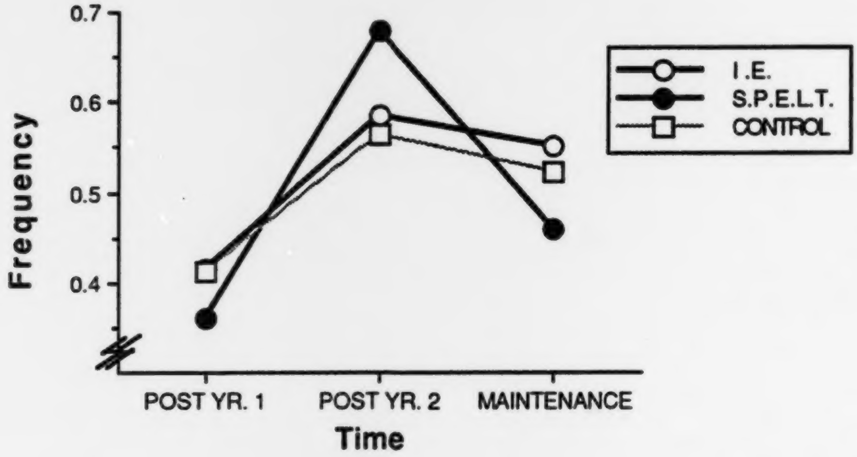
Math Strategy (Using Manipulatives): Grade 7 learning disabled



The strategy of determining the reasonableness of an answer also differentiated the groups as a significant group-by-time interaction was observed (F=2.60, df=4,194, p=.037) Figure 26 displays the means of the three groups over time. The interaction appears due to the behavior of the S.P.E.L.T. students compared to the other two groups. The S.P.E.L.T. students indicated a greater frequency of use of this strategy after two years of instruction compared to I.E. and control students. At the end of maintenance, however, the S.P.E.L.T. students displayed a lower frequency of usage.

Figure 26

Math Strategy (Determining Reasonableness of an Answer): Grade 7 learning disabled



There were no significant differences found with respect to the strategies of **rereading, guessing and checking.**

Synopsis of Results

A number of experimental program effects were observed for the learning disabled student at the grade 7 level. Changes were observed after two years of instruction for standardized measures of both math computation and problem solving. I.E. students performed better in math computation than both S.P.E.L.T. and Control students at the end of the two years of instruction but this difference washed out at the end of maintenance. This pattern for I.E. students was also observed for problem solving ability.

The reading and math related strategy measures also displayed some changes as a result of program implementation. This was particularly true for S.P.E.L.T. students. The results were not consistently significant. However, the majority of trends indicated changes in favor of the experimental students. In the math problems strategy assessment, the strategy of **determining alternative ways of solving a problem** was used more frequently by both S.P.E.L.T. and I.E. students.

Grade 7 Average Achieving

Cognitive Abilities

Three ANOVAs were conducted using verbal, non-verbal and quantitative scale scores from the *CCAT* as the dependent measures. With respect to verbal and non-verbal ability no significant interactions were obtained. There was however a significant group main effect evident with respect to non-verbal ability (F=6.21, df=2,77, p=.003). The means over time for I.E., S.P.E.L.T. and Control students were 101, 109, and 104 respectively. The means at pretest were very similar (100.0, 103.6, 99.8) so it is unlikely the differences obtained had any significant effect on program results obtained. However, a significant group-by-time interaction was observed for quantitative ability (F=3.27, df=2,72, p=.04). Increases in quantitative scores are evident for both S.P.E.L.T. and Control students but not for I.E.. The pre-test-post-test means scores for I.E., S.P.E.L.T. and Control were 95 and 98, 104 and 114, and 98 and 102 respectively.

Academic Achievement

Four ANOVAs were carried out utilizing reading comprehension, reading vocabulary, math concepts and application, and math computation grade equivalent scores from the CAT as the dependent measures. There were no significant group-by-time interactions observed for any of the four academic achievement variables.

Affective Perceptions

Perceived Competence

Four ANOVAs were conducted utilizing social, physical, cognitive and general subscale raw scores from the *Harter Perceived Competence Scale* as the dependent variables of student perception of their competence. There were no significant group-by-time interactions or group main effects observed for cognitive, social, physical or general perceived competence. It appears that the two cognitive education programs did not have a significant impact on the average achieving grade 7 students' perception of their competence over three years.

Self Concept

Two ANOVAs were carried out utilizing school, and general self-concept scores from the *Coopersmith Self-Esteem Inventory* as the dependent measures. There were no significant group-by-time interactions obtained for either of the two sub-scales of self concept. Thus the two experimental programs do not appear to affect the self concept of grade 7 average achieving students over a three year period.

Locus of Control

One ANOVA was carried out using internal locus of control raw scores from Crandall's IARQ as the dependent variable. The group-by-time interaction for overall internal control scores was not significant.

Cognitive Strategies

Metacognitive Reading Awareness

A group ANOVA was carried out using total reading awareness scores from the Paris Reading Awareness Questionnaire as the dependent variable.

The results indicated no significant group main effect or group-by-time interactions. The two cognitive education programs did not appear to significantly affect the metacognitive reading awareness of grade 7 average students over the three years.

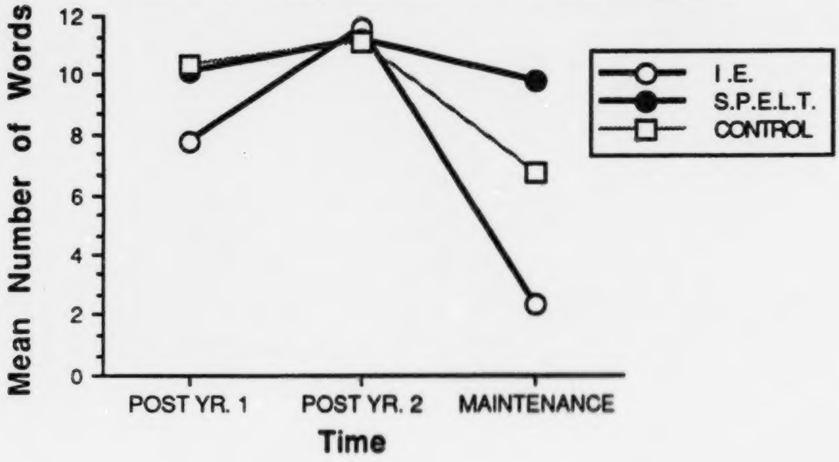
Reading Cloze Performance

Two ANOVAs were carried out utilizing the number of **synonyms** and **absolutely correct** words from the *Cloze Task* as the dependent variables. The results for the use of **absolutely correct** words indicated a significant main effect for group (F=9.27, df=2,72, p=.001) as well as a significant group-by-time interaction (F=4.68, df=4,144, p=.001). Figure 27 depicts the groups means over the three test points.

The interaction appears due to the generally high level of performance of S.P.E.L.T. students at the end of the maintenance year as compared to I.E. students and to a lesser extent Control students. Interestingly, the S.P.E.L.T., I.E. and Control students do not differ at the end of two years of instruction. I.E. students performed less well than either S.P.E.L.T. or Controls at the end of maintenance.

Figure 27

Cloze (correct): Grade 7 average students



Comprehension Monitoring

Two ANOVAs were conducted utilizing the total errors detected for each of the two passages from the *Error Detection Task* as the dependent variables. The results indicated no significant group main effects or group-by-time interactions for either of the two passages. The two cognitive education programs did not appear to affect the comprehension monitoring skills of grade 7 average students as measured by the error detection paradigm.

Perceived Problem Solving Ability

A one way ANOVA was carried out using perceived problem solving total raw scores from the *Perceived Problem Solving Inventory* as the dependent variable. The results indicated no significant differences among the three groups of students. The means for I.E., S.P.E.L.T. and Control students were 103.8, 98.9, and 104.1, respectively. The two cognitive education programs do appear to affect the perceived problem solving ability of grade 7 average students at the end of the three years.

Math Problem Solving Strategies

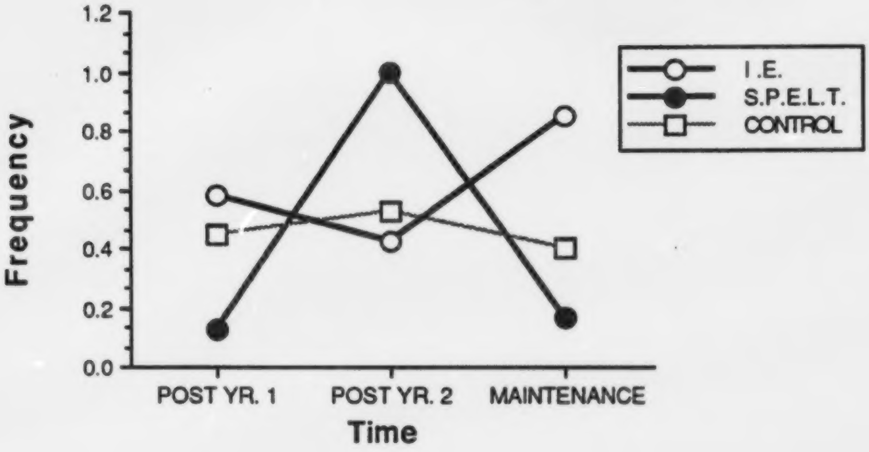
The frequency of use of each of the six strategies, **rereading, stating plans, determining alternative ways of solving the problem, guessing and**

checking, using manipulatives, and **determining reasonableness of answer** from the strategy assessment: math problems were subjected to ANOVAs.

The only significant effect was with respect to the strategy of **determining the reasonableness of an answer.** A significant group-by-time interaction was obtained (F=7.10, df=4,158, p<.001). Figure 28 displays the means of the three groups over time.

Figure 28

Math Strategy (Determining the Reasonableness of an Answer): Grade 7 average students



This effect appears to be due to the behavior of the S.P.E.L.T. students who, after one year of instruction, displayed little use of the strategy compared to I.E. and Control students. However, at the end of two years of instruction they displayed significantly higher frequency of use. The end of maintenance check indicates I.E. students displayed a greater frequency of use than either S.P.E.L.T. or Control students; S.P.E.L.T. students used the strategy the least. Interestingly, the Control students displayed a consistent level of use of the strategy over the course of the three years.

Synopsis of Results

Few obvious experimental effects were observed for grade 7 average students. There was some indication of increased performance in using contextual strategies in reading after the three years (as measured by cloze performance) for S.P.E.L.T. students compared to I.E. and Control students. Few other significant effects were observed.

Grade 7 Gifted

Cognitive Abilities

Three ANOVAs were carried out using verbal, non-verbal and quantitative scale scores from the *CCAT* as the dependent measures.

A significant group-by-time interaction was obtained for verbal ability (F=4.99, df=2,75, p=.009). The interaction appeared to be due to the increase by I.E. students, a decrease by Control students, and S.P.E.L.T. students essentially remaining stable with respect to verbal ability, over time. The pre-test post-test means for I.E., S.P.E.L.T. and Control students were 119 to 124, 123 to 122, and 12 to 118, respectively.

A group-by-time interaction was also obtained for non-verbal ability (F=3.35, df=2,74, p=.04). This effect appears to decrease in non-verbal scores by the Control students from pretest to the end of the three years. S.P.E.L.T. students, however, displayed an increase over time and I.E. students remain relatively stable. The pre-test post-test means for I.E., S.P.E.L.T. and Control students were 119 to 123, 121 to 128, and 116 to 115, respectively.

No significant group-by-time interaction were obtained with respect to quantitative ability.

Academic Achievement

Four ANOVAs were carried out using reading comprehension, reading vocabulary, math concepts and application, and math computation grade equivalent scores from the *CAT* as the dependent measures.

No significant group-by-time interactions were observed for reading comprehension or vocabulary, however, a significant interaction was obtained for math computation (F=4.75, df=4,122, p<.001) and a trend towards a significant interaction was also noted for math concepts and application (F=2.16, df=4,122, p=.077). Figures 29 and 30 depict the interactions for math computation and math concepts and application respectively.

The math computation ability of I.E. and S.P.E.L.T students after two years of instruction is at almost the same level as Controls. At the end of the maintenance period the Control students outperformed the other two groups.

Figure 29

Math Computation: Grade 7 gifted

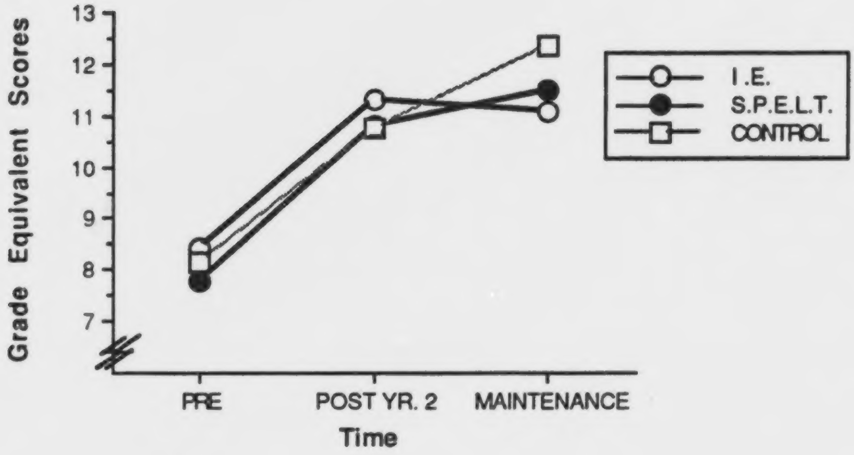
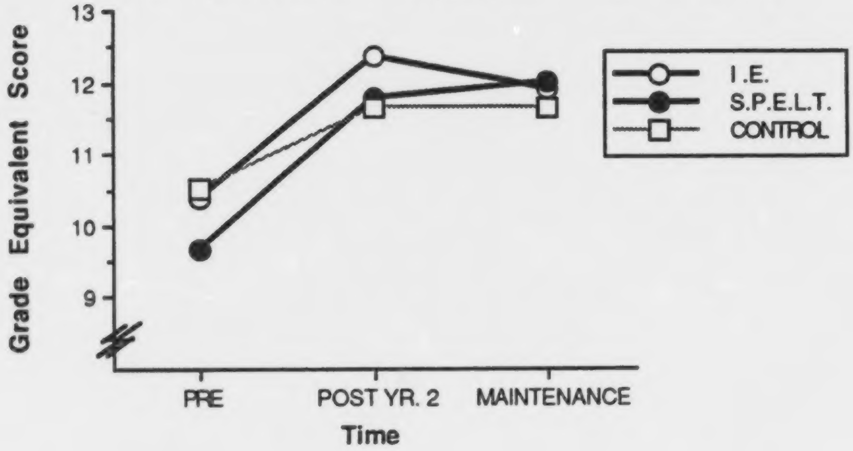


Figure 30

Math Concepts and Application: Grade 7 gifted



Grade 7 gifted students in all three treatment conditions demonstrated increased performance in problem solving at the end of experimental program implementation, with the I.E. students having a slight edge. However, at the end of maintenance, all students displayed about the same level of performance (see Figure 30).

Affective Perceptions

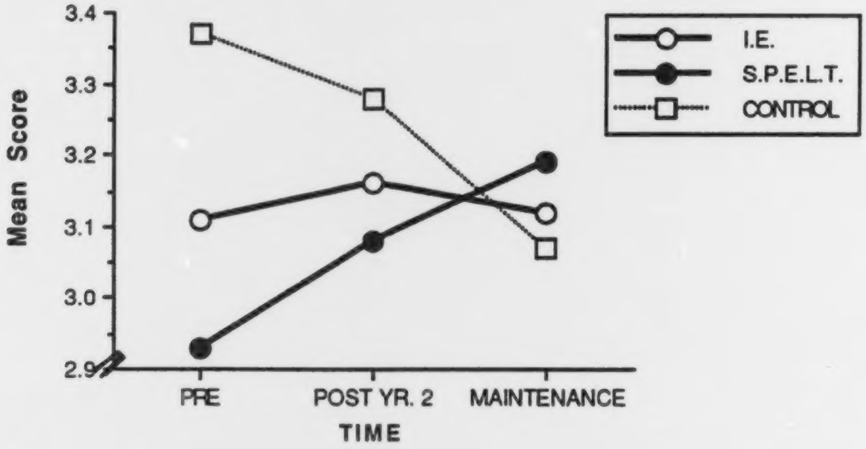
Perceived Competence

Four ANOVAs were carried out. The dependent variables were perceived competence raw scores in the cognitive, social, physical and general domains from the *Harter Perceived Competence Scale.* The results indicated no significant group main effects or group-by-time interactions for the cognitive, physical, or social domains, however, there was a significant interaction (F=3.31, df=4,128, p=.013) for general perception of competence (See Figure 31).

The interaction appeared due to the high levels of perceived competence of control students as compared to experimental students which disappeared at maintenance. Control students decreased in perceived competence over time whereas S.P.E.L.T. students increased in perceived competence. I.E students remained fairly stable on this variable.

Figure 31

Perceived Competence (general): Grade 7 gifted



Self Concept

Two ANOVAs were carried out utilizing school and general self-concept from the *Coopersmith Self-Esteem Inventory* as the dependent measures. No significant group-by-time interactions were obtained. It therefore appears that the two cognitive education programs did not affect the school and general self concept of grade 7 gifted students, over a three-year period of time.

Locus of Control

One ANOVA was carried out using internal locus of control raw scores from Crandall's *IARQ* as the dependent variable. The results indicated no significant group effects for internal locus of control.

Cognitive Strategies

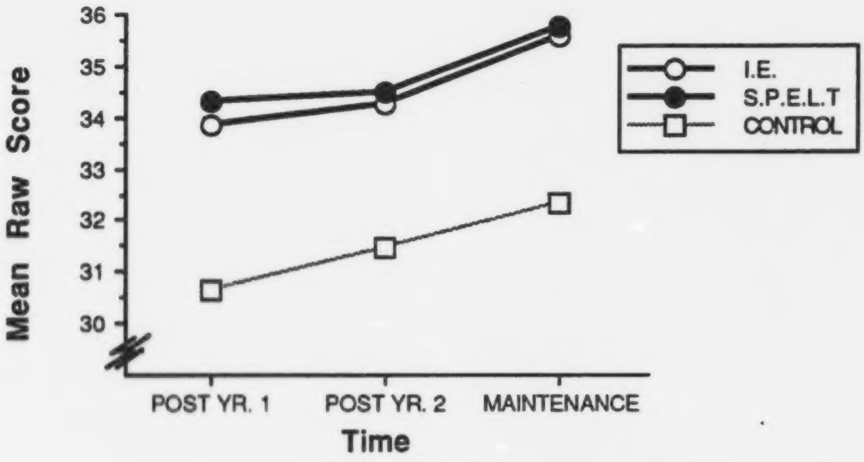
Metacognitive Reading Awareness

An ANOVA was conducted using total reading awareness raw scores from the *Paris Reading Awareness Questionnaire* as the dependent measure.

The results indicated a significant group main effect (F=8.48, df=2,63, p=.001) but no significant group-by-time interaction. The means for I.E., S.P.E.L.T. and Control students were 34.6, 34.9 and 31.5 respectively. Overall the two cognitive education programs significantly affected gifted grade 7 students' metacognitive awareness in reading. After only one year of instruction the metacognitive reading awareness of these students appeared to be enhanced by both experimental programs and this difference was maintained over time (see Figure 32).

Figure 32

Metacognitive Reading Awareness: Grade 7 gifted



Reading Cloze Performance

Two ANOVAs were carried out using the number of **synonyms** and **absolutely correct** words from the *Cloze Task* as the dependent variables.

The results for use of **synonyms** did not indicate a group main effect. The group-by-time interaction, however, did reach significance (F=8.92, df=4,160, p=.001). Figure 33 displays the group means over the three test points.

It appears that the interaction was due mainly to the behavior of the I.E. students. They performed at lower levels than both S.P.E.L.T. and Control students after one year of instruction but after two years both S.P.E.L.T. and I.E. outperformed Control students. I.E. students maintained this superior performance at the end of maintenance with S.P.E.L.T. and Control students displaying similar performance.

With respect to **absolutely correct** words, a significant main effect for group (F=16.10, df=2,79, p<.001) and a significant group-by-time interaction was evident (F=12.46, df=4,158, p<.001). Figure 34 displays the group means over the three test points. The means over time for I.E., S.P.E.L.T. and Control were 7.2, 10.4, and 9.4 respectively. Inspection of Figure 34 indicates that the interaction appears due to the lower level of performance of I.E. students after one year of instruction and at end of maintenance as compared to S.P.E.L.T. and Control students. S.P.E.L.T. students performed at essentially the same levels as Control students after each of the first two years of instruction. However, S.P.E.L.T. students outperformed both of the other two groups of students at the end of the maintenance year.

Figure 33

Cloze (synonyms): Grade 7 gifted

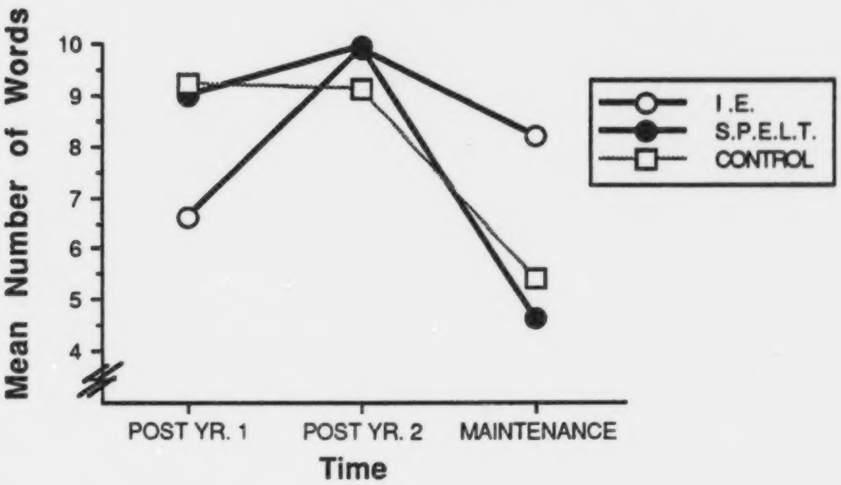
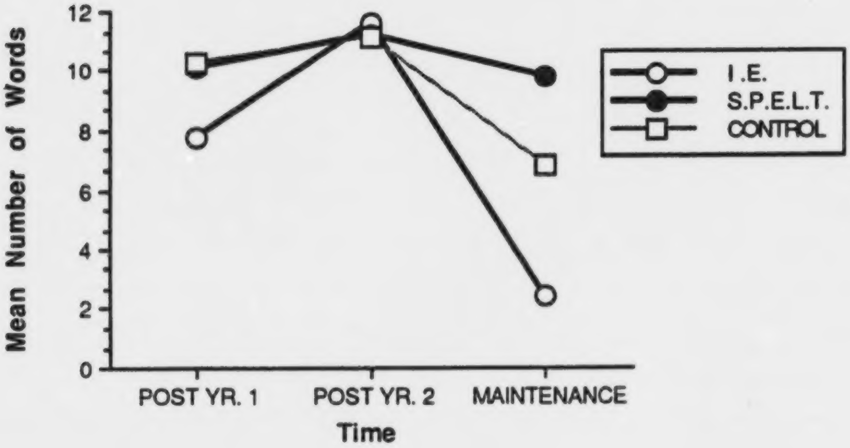


Figure 34

Cloze (correct): Grade 7 gifted



Comprehension Monitoring

Two group ANOVAs were carried out using the total number of errors detected for each of the two stories from the *Error Detection Task* as the dependent variables. With respect to the passage given at approximately instructional level, a trend towards a significant main effect appears to be due to higher levels of performance of both I.E. and S.P.E.L.T. as compared to Controls (see Figure 35). The group means over time were 4.1, 4.3, and 3.7 for I.E., S.PE.L.T. and control students respectively. The means for the significant interaction obtained (F=3.88, df=4,132,p=.005) are displayed in Figure 35. It appears that I.E. students performed essentially the same as controls after about six months of instruction but then continued to display increasing performance compared to controls at the end of years two and three. S.P.E.L.T. students on the other hand displayed greater degree of performance after about six months of instruction and then fell to similar levels as I.E. students at the end of two years.

The results indicated a significant group main effect for the passage given at approximately frustration level (F=3.88, df=2,66, p=.026) and a significant group-by-time interaction (F=4.04, df=4,132, p=.004) (see Figure 36). The mean number of errors detected for I.E., S.P.E.L.T., and Control students for the passage given at instructional level were 3.2, 3.4, and 2.4, respectively. The students in the two experimental conditions outperformed their control counterparts.

Figure 35

Comprehension Monitoring (Instructional Level): Grade 7 gifted

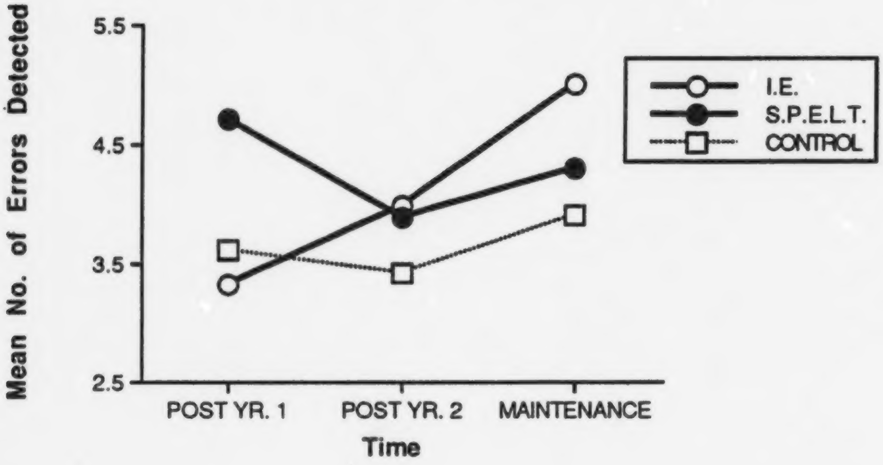
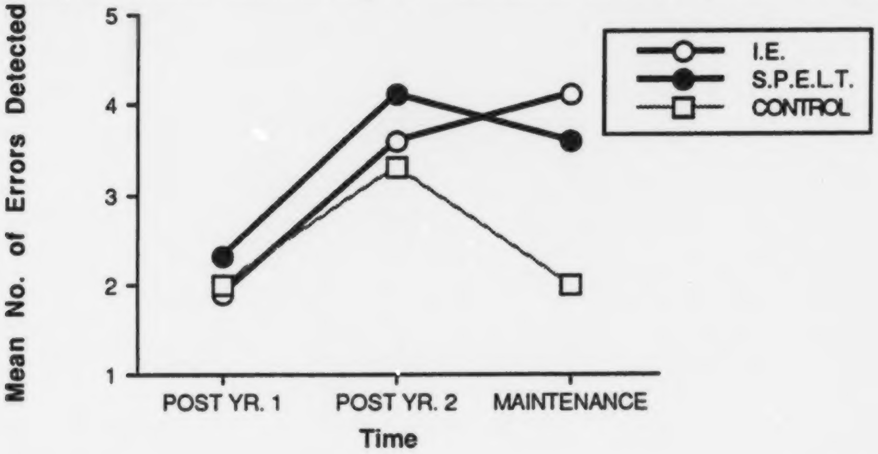


Figure 36

Comprehension Monitoring (Frustration Level): Grade 7 gifted



Perceived Problem Solving Ability

A one way ANOVA was carried out using perceived problem solving total raw scores, at maintenance, from the *Perceived Problem Solving Inventory* as the dependent variable. The results indicated no significant differences between the three groups of students. The means for I.E., S.P.E.L.T. and Control students were 113.2, 110.3, and 106.9, respectively. The two cognitive education programs did not appear to significantly affect the perceived problem solving ability of grade 7 gifted students at the end of the three years, although, the groups' means followed a pattern, favoring the two experimental groups.

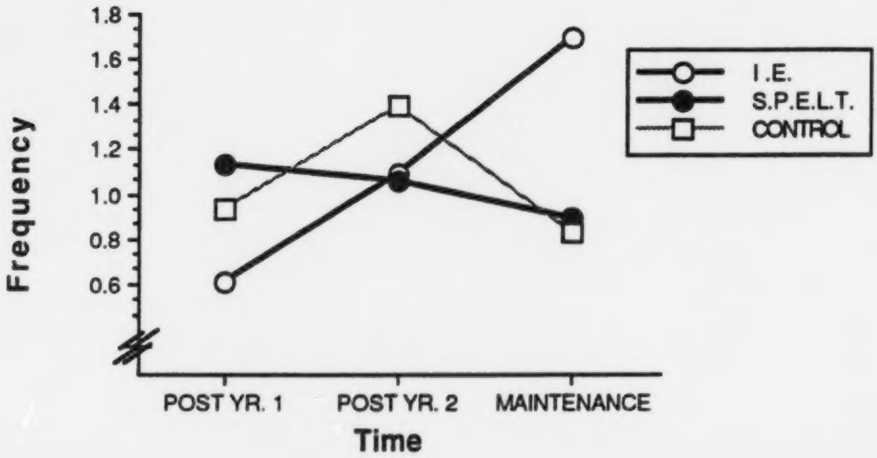
Math Problem Solving Strategies

The frequency of use of each of the six strategies from the strategy assessment math problems, were submitted to group-by-time ANOVAs. With respect to the frequency of usage of the **rereading** strategy a significant group-by-time interaction was obtained (F=7.34, df=4,170, p<.001). Figure 37 displays the means of the three groups over time.

The interaction appears mainly due to the difference in the three groups at maintenance. The I.E. students displayed greater usage of the **rereading** strategy compared to both Control and S.P.E.L.T. students.

Figure 37

Math Strategy (Rereading): Grade 7 gifted

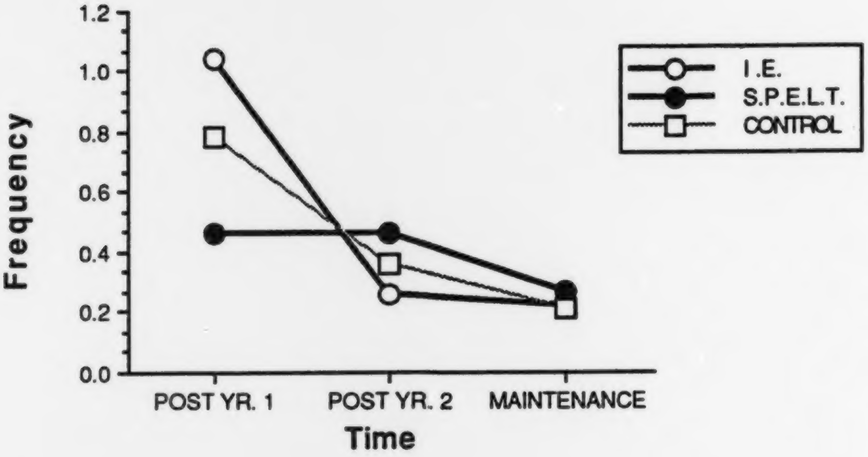


The frequency of the **use of manipulatives** as a strategy also differentiated the three groups over time, as the group-by-time interaction was significant (F=2.98, df=4,170, p=.021). Figure 38 displays the group means over the three time periods.

The interaction is mainly due to the higher frequency of usage of this strategy by I.E. students compared to S.P.E.L.T. after one year instruction. However, after two years of instruction and at the end of the maintenance year, the groups displayed almost the same frequency of use of this strategy.

Figure 38

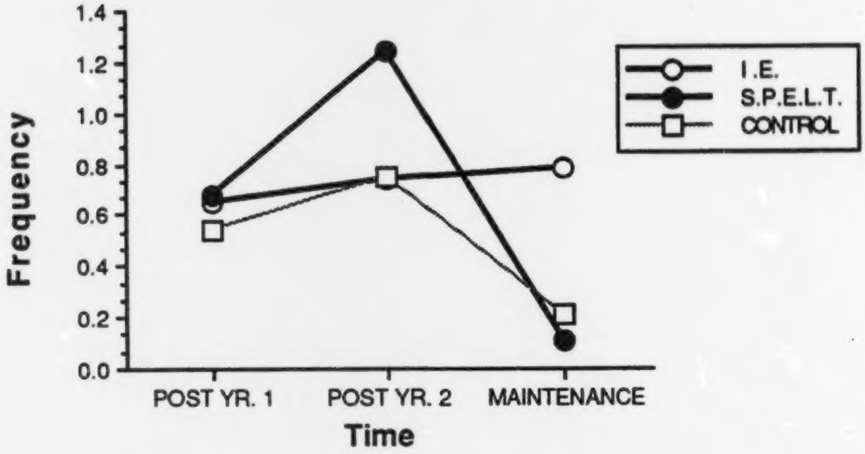
Math Strategy (Using Manipulatives): Grade 7 gifted



The frequency of usage of the strategy **determining the reasonableness of an answer** also differentiated the three groups as a significant group-by-time interaction was obtained (F=4.73, df=4,170, p=.001). Figure 39 displays the group means over the three time periods.

Figure 39

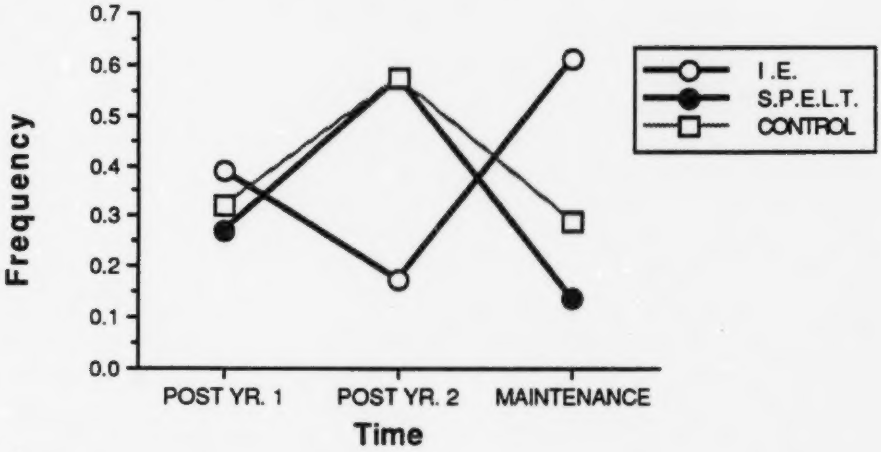
Math Strategy (Determining the Reasonableness of an Answer): Grade 7 gifted



The interaction appears to be due to the behavior of the S.P.E.L.T. students after two years of instruction, and I.E. students at maintenance. After two years, S.P.E.L.T. students displayed greater usage of this strategy than I.E. or Control students. At the end of the maintenance year, I.E. students maintained the same basic level of use, whereas both S.P.E.L.T. and Control students decreased in the frequency of usage, to essentially no use of the strategy. The frequency of usage of the strategy **stating plans** differentiated the groups as well. The group-by-time interaction was significant (F=3.72,df=4,170, p=.006). Figure 40 displays the group means over time.

Figure 40

Math Strategy (Stating Plans): Grade 7 gifted



The interaction appeared due to the behavior of the I.E students compared to both the S.P.E.L.T. and control students. After two years of instruction the I.E students displayed a decrease in use of the strategy whereas both control and S.P.E.L.T. students displayed an increase. At the end of maintenance, however, I.E. students showed a greater frequency of use of the the strategy compared to the other two groups.

Synopsis of Results

The results for the grade 7 gifted students displayed some interesting patterns. There were indications of some change in achievement in math concepts and application, and computation. The standardized math computation performance of the I.E. students, and to a lesser extent the S.P.E.L.T. students, appeared to be affected after two years of instruction. The gains over the two years for I.E., S.P.E.L.T., and Control students were 2.9, 3.0 and 2.6 respectively. However, these differences tended to be eliminated at maintenance with Controls doing better. Ceiling effects were beginning to play a part in the results of math computation for the grade 7 gifted after two years and at maintenance. The math concepts and application performance appeared also to be affected to some extent by both I.E. and S.P.E.L.T. teaching. The gains, after two years of instruction for I.E., S.P.E.L.T., and Control, were grade equivalents of 2.0, 2.0 and 1.1, respectively.

In the area of affective perceptions, there were no significant program effects observed for any of the three measures: perceived competence, self-concept, or locus of control.

With respect to reading there were no significant effects observed for standardized measures of reading. This is to be expected since the initial level of performance by all of the gifted students was high at the outset. There was, however, evidence of positive change in metacognitive reading strategy awareness and comprehension monitoring ability for both I.E. and S.P.E.L.T. over Control students.

The math strategies students chose to use in solving particular math problems also demonstrated some experimental effects particularly for I.E. students and, to a lesser extent, S.P.E.L.T. students.

Chapter Summary

In this chapter we have presented the results of the measures of student change observed over the course of three years. The results were described in some detail with overall interpretation left for the last chapter entitled *Summary, Conclusions, and Recommendations*. A number of significant results were obtained particularly for learning disabled students and to a lesser extent gifted students. Fewer significant results were obtained for average students.

In order to provide a more comprehensive overall evaluation of program impact, the perceptions of parents, teachers and administrators were solicited. The following chapter describes the perceptions of these participants involved in the study.

Chapter 8

PARTICIPANTS' PERCEPTIONS

In order to monitor and evaluate the evolving perceptions of each of the participating groups (i.e., parents, teachers, and administrators), with respect to their involvement in the Cognitive Education Project, survey questionnaires were developed and administered to each group on an annual basis. Presented in this chapter are summaries of the information gathered from these surveys. Actual questionnaires and tables outlining all results are presented in Appendices G through K.

Teachers' Perceptions

The purpose of these questionnaires was to determine the teachers' perceptions of the project regarding support and consultation provided by the team, test administration concerns, usefulness of test data provided, pupil behavior change, inservice effectiveness, appropriateness of experimental program to grade, class size, and time allotted for strategy instruction (See Appendices G and K for complete results and specific questions).

Three questionnaires were developed to ascertain the perceptions of the teachers involved in each experimental group in the Cognitive Education Project (32 items for I.E., 34 items for S.P.E.L.T. and 13 items for the Control group). Although these questionnaires were condition specific, a number of the items were common to both of the cognitive education programs and a few were common to all three questionnaires.

The following provides a summary of the responses to the questions pertaining specifically to strategies and strategy program evaluation. These questionnaires were distributed to all project teachers during the month of May in 1985, 1986, and 1987.

Overall Results

The vast majority of the I.E. and S.P.E.L.T. teachers found the project team to have been supportive and indicated that any problems which had arisen were satisfactorily resolved. In general, teachers from all three experimental conditions felt that clear instructions had been given for the administration of the group tests, although some teachers had indicated having some concerns regarding the administration of the group tests to their students. This was particularly evident for the grade 4 and grade 7 teachers (Phase 1, 1985 and Phase 2, 1986) but was expected since two data points were included in the first year of the study.

The vast majority of the participating teachers found the inservice training to have been adequate in preparing them to implement both experimental programs and consequently they felt competent in initiating instruction (see Appendix J for evaluation of inservice). As reported earlier, the project team provided follow-up visits to help teachers in program implementation. The majority of teachers indicated that these visits were helpful. With respect to adequacy of time allotted for instruction, many I.E. teachers (i.e., 50%) indicated that it was difficult to allot the required time because of curriculum constraints as well as Alberta Education testing.

The majority of S.P.E.L.T. teachers indicated that their program procedures were suitable for group instruction given the number of students in their classes (i.e., 15-35). I.E. teachers, on the other hand, were more concerned about the suitability of teaching I.E. to their entire class. In particular they suggested that appropriate class sizes would be from 12 to 15 students. However up to a maximum of 22 students could be managed.

Teachers in both the I.E. and the S.P.E.L.T. conditions at grade 7 did not apparently perceive great differences from Control teachers in academic achievement after one or two years of instruction. At grade 4, the experimental teachers tended to indicate student changes more often than their control counterparts. These numbers, however, were very small and consequently are difficult to interpret.

At the end of years one and two, the vast majority of I.E. and S.P.E.L.T. teachers observed their students using the learning/thinking strategies across different classrooms and subjects. Those teachers who had continued to work with the programs also indicated that their participation in the study had enhanced their professional development.

All teachers trained in S.P.E.L.T. indicated that they would continue to use the instructional procedures even after their involvement with the Cognitive Education Project had ended. The majority of the I.E. teachers also indicated that they would like to continue to use the procedures. Over 95% of all of the teachers of grades 4, 5, 7, and 8 indicated that they would recommend their respective programs to other teachers.

Teachers' Comments

The following provides a representation of additional spontaneous comments made by experimental teachers according to program and grade, in response to the request to make additional comments. (Not all teachers responded).

I.E. - Grade 4

Year one teachers felt the homeroom teacher should teach the program. Teachers at years one and two observed the importance of stressing "bridging". Year two teachers felt that all teachers in the school should be involved in teaching the program, as they felt isolated. At year one, one teacher suggested that the manual lessons be adapted. At year two a teacher suggested that Level 1 be taught at grade 4 and Level 2 be taught at grade 7. It was also suggested that testing be incorporated into the program so that students continue "to take I.E. seriously" in the second year.

Teachers, at both year one and two observed an increase in student interest and effort in schoolwork. Students were observed to be more confident, inquisitive, and "developing better and varied ways of solving problems". Year two teachers observed an increase in discussion. Another year two teacher observed that weak readers found the instruments difficult.

I.E. - Grade 7

Year one teachers commented that the information on the program should be made available to administrators. Both year one and two teachers felt it would have been beneficial to observe an I.E. instructor in the classroom setting. A year two teacher felt I.E. should be divided into grade levels. Year two teachers suggested that the further development of the areas on discussion and questioning techniques would be beneficial. The need for feedback or inservicing after a few months of teaching Level 1 was also suggested.

Some year one and two teachers observed students to be "more precise in questioning and discussion". Some year two teachers noticed "interest dwindling" at Level 2. Students were observed to be "tired of discussion", although one teacher did observe an increase in discussion.

S.P.E.L.T. - Grade 4

Teachers after one and two years of instructing S.P.E.L.T. suggested follow-up inservices as well as the need for feedback sessions during the school year to allow for teacher/colleague interaction. Year one teachers would have liked to have spent more time on the area of student development of strategies. Year two teachers commented that areas in planning and advising should be further developed.

Teachers at year one and two commented that they observed their students to be more "accepting", "enthusiastic", "confident" and "inquisitive." Teachers also made the observation that students made "more of an effort on schoolwork". Students consistently were not applying strategies in year one but by the second year students were observed to be generating new strategies, as well as linking strategies to different areas. A year two teacher observed that it took time for her students to accept the idea of developing strategies but by year two, student interest and effort increased.

S.P.E.L.T. - Grade 7

Teachers would have liked sample lesson plans included in their teacher package. One teacher found strategies that were not related to language arts too time consuming. Some teachers suggested that S.P.E.L.T. become part of the curriculum to deal with the time commitment difficulty.

With respect to student behavior, students were observed to be "using strategies spontaneously", notetaking had improved and strategies were being incorporated in studying. Some teachers commented that students were taking more responsibility for their learning. Some teachers found that once the "novelty wore off" the use of strategies declined.

Control

Control teachers made very few spontaneous comments. The comments that were made referred to the inconvenience of scheduling testing required by the project. Some Control teachers at year three expressed an interest in the different cognitive education programs.

Follow-up Questionnaire Results

A final follow-up teacher questionnaire was administered in November 1988 and January 1989 to determine teacher perceptions of various facets of their program involvement one and one-half to two years after direct involvement. Fifty-one percent of the teachers involved in teaching the experimental programs were available for comment (21 I.E. teachers and 20 S.P.E.L.T. teachers).

None of the I.E. trained teachers indicated that they were teaching I.E. in its entirety. This result was to be expected, considering the financial commitment and time allotment involved in offering this program. A number of the S.P.E.L.T. teachers, at both the elementary and junior high school levels, indicated that they were teaching S.P.E.L.T. in its **entirety**. The majority of the S.P.E.L.T. and I.E. teachers, over 85%, reported that they were continuing to teach certain aspects of each program to their present classes. In general, teachers did not indicate that either S.P.E.L.T. or I.E. was most beneficial to one particular ability level. Instead the data indicate that all ability levels benefitted from the instruction (See Appendix G). The one exception to this was at the junior high level where some teachers indicated that I.E. was especially suited for below average students.

The majority of I.E. and S.P.E.L.T. teachers, at both the elementary and junior high levels, indicated that given the opportunity they would choose to teach their respective programs to their classes. All of the respondents in both cognitive education programs indicated that they would recommend their program to their colleagues. This is extremely positive considering that these teachers had been away from teaching the respective programs for 1-1/2 to 2 years.

Inservice Training Questionnaire Results

The teachers at the end of each inservice session for both S.P.E.L.T. and I.E. were requested to provide a candid evaluation of the sessions, by responding to a questionnaire (see Appendix K for questionnaire). The categories measured by the questionnaire were related to four major components (qualities of the instructor, course content, underlying theory; teachers' perceptions of the relevance of the inservices; group size, and time allotment; and audiovisual materials). The specific responses to the questionnaire can be found in Appendix J for both Phase 1 and Phase 2 inservices.

The results of the evaluations were extremely positive for both S.P.E.L.T. and I.E. inservices. The teachers indicated that in general they had found the inservice training to have been adequate in preparing teachers to implement the programs. The inservices, coupled with the follow-up on-site classroom visits, were viewed very positively. A large number of teachers also spontaneously commented on the inservice evaluation questionnaires that the training should be made available to all teachers and indeed, be an integral part of the pre-service training of teachers.

Synopsis of Teachers' Perceptions

The perceptions of the participating teachers were extremely positive for both I.E. and S.P.E.L.T.. Immediately following implementation and project involvement, all teachers in S.P.E.L.T. and the majority of I.E. teachers, indicated that they would like to continue using the procedures. One and one-half to two years later, a significant number of teachers (85%) indicated they were indeed teaching certain aspects of the program to their classes. All the teachers in I.E. and S.P.E.L.T. indicated that they would recommend their respective programs to their colleagues and furthermore, that involvement in the training had enhanced their professional development. These same questions received overwhelmingly affirmative responses from the teachers, when they were asked one and one-half to two years after program involvement. The inservice training and follow-up support was also considered to be appropriate, although some teachers indicated more inservice days spread over the year, after the initial three days of inservice, would have been beneficial. Teachers generally felt that both programs were effective for all student ability levels, although some I.E. junior high teachers indicated that the program was very appropriate for low ability students.

Principals' Perceptions

An eleven item questionnaire regarding the principals' perception of both the implementation of the experimental programs and participation in the Cognitive Education Project in general, was distributed to all principals in May of 1985, 1986, and 1987 (See Appendices H and K for complete results and specific questions). A follow-up survey was also administered to principals involved in the cognitive education programs in January/February 1989 to determine their perceptions regarding their involvement in the study. The following provides a summary of the principals' responses to the questions asked during all three years of the project.

Principals in the I.E. Program

In general, the I.E. principals (n=27) were relatively positive about both the implementation of the program and about their school's involvement in the Cognitive

Education Project. In particular, the principals' perception of teacher enthusiasm regarding program participation and inservice training was extremely positive. In Year 1, 73%, during Year 2, 87% and during Year 3, 89% of the principals rated their teachers as being in the higher range of enthusiasm. This degree of enthusiasm was maintained. In fact, many of the administrators noted an increase, over the course of the year, which they indicated was a result of project involvement.

It is interesting to note, that approximately 31% of the principals in the first year, 23% in the second year, and 25% in the third year, indicated that their teaching staff had requested inservicing from either their own participating teachers or project staff. Overall, with respect to consultation and support provided by the project team, 88% of the I.E. principals in the first year, 64% in the second, and 25% in the third indicated either agreement or strong agreement with the statements that the project team was supportive and able to resolve any problems which may have arisen.

Principals in the S.P.E.L.T. Program

Principals (n=21) of teachers involved in the S.P.E.L.T. program, also indicated a high degree of enthusiasm towards both the program and the inservice training. During the first year, 89%, second year 88%, the third year, 89%, of the teachers were rated as being in the higher range of enthusiasm directly after the inservice training. Furthermore, 33% in Year 1, 56% in Year 2, and 67% in Year 3 of these same teachers were reported, by their principals, to have increased their level of enthusiasm as the program progressed. One hundred percent of the responding principals from Year 1, 62% from Year 2, and 90% from Year 3, indicated that consultations with the project team had led to satisfactory resolutions of problems and that they had found the project team to have been supportive.

Principals in the Control Condition

Since the Control principals (n=24) were given the same questionnaire that was distributed to the I.E. and S.P.E.L.T. principals, a number of the items (those concerning inservice) were inappropriate. For this reason, a number of principals failed to complete the questionnaire. In general, the principals indicated that their participating teachers were enthusiastic about the project. As with the principals in the other two conditions, those in the Control schools also found the project team to have been supportive and competent in resolving any problems which may have arisen over the course of the year.

As expected, the principals involved in the Control condition were relatively less informed (than the I.E. and S.P.E.L.T. principals). However, they had fewer concerns regarding their school's participation in the Cognitive Education Project than did the principals involved in the two experimental conditions.

Principals' Comments

The following provides a representation of additional spontaneous comments provided by principals that are reported verbatim.

I.E.

- I would recommend the compulsory inservicing of administrators prior to program commencement.
- I believe this was a most worthwhile project in spite of the difficulty in scheduling.
- The replacement of the initial participating teacher reduced likely benefits. Year one participation was enthusiastic and productive.

S.P.E.L.T.

- A very worthwhile project that the staff is excited about.
- This has been an excellent project for both teachers and students.
- A full staff inservice would be appreciated.
- The 1986-87 teacher was new to both subject areas being taught. Burdens thereby created for her prevented full participation in the project.
- The strategies taught are clearly a direction that education is going.
- I have very positive feelings about the program.
- Should be an integral part of schooling at all grade levels and I am very supportive of program.

Follow-up Questionnaire Results

Principals were contacted by phone in January and February of 1989 and asked for their perceptions of the experimental programs (I.E. and S.P.E.L.T.) which had been implemented in their school (one and one-half to two years following their direct involvement in the study). Fifty percent of principals involved in the experimental programs were available for comment. Of the 27 principals in I.E., the project was able to contact 14, three of whom were principals for both grade 4 and 7 classes during implementation. Of the 21 principals in S.P.E.L.T., 10 were contacted for comment.

The principals were asked to respond to two questions. (1) Would they consider adopting the experimental program in their school and (2) Would they recommend the program to other schools.

In answer to question one, over half of the principals would consider adopting the experimental programs (six grade 4, and four grade 7 principals - I.E.) and four grade 4, and two grade 7 principals - S.P.E.L.T.). Two principals at the grade 4 level and three at the grade 7 level would not consider incorporating I.E. into their schools because they felt the program was isolated from curriculum and they had seen no evidence of generalization or transference of skills to the curriculum. One observation was that aspects of the I.E. program's methodology could also be found in the whole language approach and social studies curriculum. Some principals responded that they were not adequately familiar with the procedure for implementation of the programs. Thus they could not recommend implementation of the programs to other classes (one grade 4 and two grade 7 I.E. principals, three grade 4, and 1 grade 7 S.P.E.L.T. principals).

Four I.E. principals at grade 4 and six at grade 7 would recommend the program to other schools. In S.P.E.L.T., three principals at grade 4 and two principals at grade 7 recommended the program to others. Two principals at grade 4 and one at grade 7 in I.E. would not recommend the I.E. program because they felt that I.E. was not for all students and that other thinking programs should be considered before using one in isolation.

The following observations were made by principals in both experimental groups.

1. Principals were concerned with the time and cost of the programs (six - I.E.; one - S.P.E.L.T.). As I.E. is an out-of-content program the concern was with the problems of adequately covering the curriculum and at the same time scheduling three forty-minute classes for I.E. instruction. Consequently, principals suggested that varying degrees of implementation should be allowed. This would require receiving detailed suggestions (program plans) for using I.E. and incorporating I.E. as a part of the Alberta Education curriculum. Principals in S.P.E.L.T. observed that thinking skills should be a school objective, entire school staff involvement should be an integral part of implementation, and teachers should be involved with the project for more than one year.
2. Three of the principals in I.E. and two in S.P.E.L.T. indicated that the programs were particularly useful for special needs students. A number of principals in

each experimental group thought the programs were of benefit when students' needs were taken into consideration when implementing the program (two in I.E. and two in S.P.E.L.T.), that is, the program is individualized. For each experimental group, it was observed that the hands-on experiences used in the respective programs worked well with upper elementary levels. One principal at the elementary level observed that the lower grades need more direct teaching than the junior high grades in S.P.E.L.T. Two principals at the junior high level found that I.E. was not being generalized by their students into the curriculum. An observation was made that year one be considered as the "To learn year" where the concern for acquiring the thinking skills procedure be the focus rather than academic changes. This would ensure adequate implementation before any evaluation of effects could occur.

3. Principals recognized that the programs addressed problem solving and confidence building skills and that they increased discussion and independent thinking.
4. I.E. principals observed the need for continuous feedback and inservicing as well as the need for the administration to be involved as a support group. All principals questioned were interested in being involved in learning/thinking programs in the future and wanted to be kept up-to-date with the outcome of this project.

Synopsis of Principals' Perceptions

Very few differences were noted between the questionnaire responses given by the S.P.E.L.T. and the I.E. principals. For the most part, principals involved in the experimental conditions viewed their teachers as being relatively enthusiastic about the project both at the conclusion of the inservice and over the course of the three years.

The one area in which discrepancies were noted, however, was the difficulty that I.E. principals encountered in scheduling and implementing the required three forty-minute I.E. classes, outside of the regular curriculum. S.P.E.L.T. principals did not note this. I.E. principals reported both personal and teacher frustration arising from these timetabling difficulties. Such problems apparently affected the grade 7 and 8 classes more frequently than the grade 4 and 5 classes.

Parents' Perceptions

The *Parent Questionnaire* consisted of nine items which asked parents to check yes or no if they had seen increases in their child's behavior over the year with respect to attention given to homework, willingness to tackle more difficult tasks, time spent on a task, ability to accept criticism, questioning, seeing alternative points of view, self confidence, and, originality in thinking. If there was program impact it was anticipated that parents of children in the experimental classes would more often indicate that they did see increases in these behaviors than would parents of children from control classes.

The *Parent Questionnaire* was condensed after the initial data collected (i.e., May, June, 1985) in both format and number of items, in an attempt to encourage more parents to respond. Although this revision resulted in a more concise method of reporting the responses, it did not noticeably increase the number of returned surveys (Appendix I shows number of returns).

Unfortunately, questionnaires were not distributed in May of the maintenance year for Phase I students. Consequently, the grade 6 and 9 data reflect the perceptions of only Phase 2 students. Since this return rate was relatively low, especially for the nonintervention grades (6 and 9), it would be inappropriate to assume that the returned questionnaires were truly reflective of the total number of parents involved in the project. A descriptive approach was taken to the analysis of the parent response because of this. Where discussion of differences are given, this is based upon a 20% or greater difference in the frequency of responses between groups. Keeping this in mind the following section highlights the responses indicated on the returned questionnaire. The highest response rates for the parent questionnaires were at grade 4 and 7 (see Appendix I). Consequently, we have analyzed these data based upon diagnostic condition as well as experimental treatment. The grades 5, 6, 8 and 9 data have been collapsed to reflect only treatment differences (see Appendices I and K for complete results and sample questionnaires).

Grade 4

Learning Disabled

Parents of learning disabled grade 4 students did not indicate that differences existed across experimental treatment conditions. In one instance (questioning), however, a greater percentage of control parents reported more changes than did I.E. parents (100% v.s. 73%).

Average

Parents of average achieving youngsters recognized behavioral differences in favor of students receiving cognitive education as compared to the Control students, in five of the items. In particular, I.E. parents, more often than Controls, indicated that their children were more **willing to tackle more difficult tasks** (66% vs. 44%), were **questioning** more frequently (95% vs. 50%) and were better **able to recognize alternative points of view** (62% vs. 42%). The S.P.E.L.T. parents, more often than Controls, also saw positive changes in their children with respect to **recognizing alternative points of view** (68% vs. 42%), **improved self-confidence** (100% vs. 44%) and increased **originality of thinking** (83% vs. 44%).

Gifted

Parents of gifted children recognized differences between those receiving I.E. and S.P.E.L.T. and those in the Control condition in seven of the items listed on the questionnaire. I.E. parents indicated that positive changes were evident in the **attention given to homework** (68% vs. 12%), in **spending time dealing with a task** (45% vs. 25%), in the **willingness to tackle more difficult tasks** (50% vs. 24%), in **questioning** (94% vs. 0%), in **taking alternative points of view** (76% vs. 52%), in **self confidence** (74% vs. 21%) and in **originality of thinking** (72% vs. 18%). Parents of children in the S.P.E.L.T. program, more often than Controls, recognized positive changes in **attention given to homework**(70% vs. 12%), **increased time spent dealing with a task** (65% vs. 25%), **willingness to tackle more difficult tasks** (66% vs. 44%), **questioning** (81% vs. 0%), **self confidence** (71% vs. 21%), and **originality of thinking** (79% vs. 18%).

Grade 5

At the grade 5 level, very few differences were noted between the responses of parents involved in all three experimental groups. However, control parents, more often than S.P.E.L.T. parents, indicated positive changes in **attention to homework** (78% vs. 46%).

Grade 6

As mentioned earlier no data were available to determine the perceptions of grade 6 Control parents. In general, whenever definite discrepancies existed between the S.P.E.L.T. and I.E. parent responses, they were in favor of the S.P.E.L.T. parents. In particular S.P.E.L.T. parents indicated that their children displayed changes in their **attention to homework, time spent dealing with a task,** and **accepting alternative points of view** more so than their I.E. counterparts.

Grade 7

Learning Disabled

Parents of S.P.E.L.T. learning disabled children as compared to parents of control students indicated that they had recognized definite changes in 5 of the 9 behaviors listed in the questionnaire (**attention to home work**, 87% vs. 58%; **time spent dealing with a task**, 67% vs. 45%; **ability to accept criticism**, 67% vs. 43%; **ability to consider alternative points of view**, 86% vs. 61%; and, **originality in thinking**, 86 vs. 58%). I.E. parents indicated that positive changes were evident in 2 of the 9 behavioral areas (**ability to accept criticism**, 75% vs. 43%; and **vocabulary**, 100% vs 50%). However, in one area (questioning), control parents indicated positive changes more frequently than S.P.E.L.T. parents. Also, in willingness to tackle more difficult tasks, control parents indicated positive changes more frequently than I.E. parents.

Average

Both I.E. and S.P.E.L.T. parents, more often than Controls, indicated that 4 definite positive behavioral changes were noted in their average achieving children. Compared to controls, more S.P.E.L.T. parents recognized improvements in their children's **attention to homework** (73% vs. 44%), **ability to understand**

alternative points of view (89% vs. 60%), **self confidence** (78% vs. 53%), and **vocabulary** (89% vs. 63%). Compared to controls, more I.E. parents indicated improvement in **attention to homework** (75% vs. 44%), **willingness to tackle more difficult tasks** (85% vs. 63%), **questioning** (100% vs. 79%), and **self-confidence** (86% vs. 53%).

Gifted

Parents of children in both cognitive education programs indicated that their gifted children had displayed positive behavioral changes in **attention to homework, time spent dealing with a task,** and **willingness to tackle more difficult tasks.** In particular, S.P.E.L.T. parents, more often than Control parents, recognized more positive changes in their children's ability to **accept criticism** (73% vs. 11%), and **understanding alternative points of view** (84% vs. 56%). I.E., more often than Control parents, reported specific increases in the number and type of **questions** (100% vs. 50%) asked by their children and increased changes in **originality in thinking** (63% vs. 33%).

Grade 8

Very few differences were noted between the responses of parents involved in all three experimental groups at the grade 8 level.

Grade 9

At the grade 9 level S.P.E.L.T. parents indicated more frequently than did their Control counterparts that their children were **spending more time dealing with tasks** (81% vs. 50%), and that their **ability to accept criticism** (70% vs. 50%) had improved. I.E. parents indicated more frequently than did their control counterparts positive changes in their children's **willingness to tackle more difficult tasks** (100% vs. 72%). In addition I.E. and S.P.E.L.T. parents reported improvements with respect to **originality of thinking** (100% and 94% vs. 65%), **self confidence** (100% and 100% vs. 72%), and **questioning** (100% and 100% vs. 71%), more frequently than did their Control counterparts.

Parents' Comments

In order to provide a more complete picture of the perceptions of the parents involved in the project, additional spontaneous comments made by parents regarding changes they observed in their children, with respect to the experimental programs, are provided in the following sections.

I.E - Grade 4

After one year of instruction some parents made the observation that their children had improved scholastically. One parent observed that it "may have not been due to the program". Parents, after one and two years of instruction, commented that their children were more "accepting of criticism". Parents after two and three years noticed that their children had a more "positive attitude toward homework" and were "more accepting of responsibility." After year two, parents commented that their children "really liked the program," the program is "helpful" and has "shown results." A parent after year three asked for more information on the program.

I.E. - Grade 7

After one and two years of instruction, some parents observed that their children's attitude toward school had improved. One parent commented that she did not observe any change in her child's behavior. After year two, some parents commented that their children were "able to handle matters diplomatically" and "able to see different points of view". One parent mentioned that she would like to see the results of the program.

S.P.E.L.T. - Grade 4

Some parents after one and two years of instruction, observed that their children worked "more independently". After year one and two, parents observed an "increase in confidence", "more patience to work out a problem", more questioning, and an increase in "expressing himself". After year two, some parents observed marks, memory, and certain subject areas had improved. After year three, some parents observed their children to be "less frustrated", "organizing ideas better", and showing "more concern about grades".

S.P.E.L.T. - Grade 7

After one year of instruction, some parents observed that their children showed more concern for schoolwork, a "better outlook on school", and discussed strategies at home. Parents commented after year one and two that they were impressed with the program. One parent after year one commented that her child "has learned to be more in tune to other people's thoughts/feelings because of the involvement with the program". Some parents at year three noticed an increase in responsibility in their child.

Control

Parent comments of children in the Control group were minimal. The comments related to acknowledging their children's teachers' efforts or mentioned that they did not know that their children were in a special program.

Synopsis of Parents' Perceptions

The perceptions of parents with respect to changes they perceived in their children suggested that there were generalizing effects being observed at home. A number of behavioral changes were related and were consistently being reported more often by I.E. and S.P.E.L.T. parents than by Controls. The most frequently reported behavior changes over grades were **attention to homework, recognizing alternative points of view, willingness to tackle more difficult tasks, self confidence,** and **questioning.** The parent data strongly supported that program effects were being generalized for both S.P.E.L.T. and I.E. students, particularly after one year of instruction and at the end of maintenance.

Chapter Summary

The perceptions of parents, teachers and principals regarding the two cognitive education programs are extremely encouraging. The vast majority of experimental teachers reported that they would continue to use the instructional procedures from the two programs. Indeed when a significant number was surveyed again in November, 1988, two years after involvement in the project, over 85% of the teachers reported they were continuing to use aspects of the programs in their teaching. This was coupled with the fact that all teachers indicated they would still recommend the programs to their colleagues.

Principals' perceptions of the two experimental programs were also generally very positive. Some concern was evident with respect to the high cost of I.E. materials as well as the practice of teaching I.E. in isolation from the rest of the curriculum. However, on follow-up questionnaires, one and one-half to two years after their involvement in the initial implementation, over half of the 24 principals said they would consider adopting the experimental programs. Many of these principals stated they would also recommend the cognitive education programs to other schools.

Finally, parents' responses, although limited in the second and third years, also indicated positive changes in their youngsters, in a number of important behavioral areas such as self confidence, task persistence, accepting alternative points of view, originality of thinking, and questioning.

CHAPTER 9

SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

Summary

Objectives and Research Questions

The Cognitive Education Project was a cooperative venture involving: 1) Alberta Education, Government of Alberta; 2) the Department of Educational Psychology, the University of Alberta; and 3) various school jurisdictions in north-central Alberta. It was established with the general purpose of undertaking a long-term evaluation of two cognitive education programs (out-of-content versus in-content) in relation to traditional instruction in elementary and junior high classrooms.

For the out-of-content approach, Feuerstein's Instrumental Enrichment (I.E.) was selected because it is one of the most comprehensive and field-tested learning/thinking programs available to date. It represents an out-of-content instructional approach utilizing paper-pencil tasks and intensive teacher-pupil discussion to teach learning/thinking skills. In contrast, the Strategies Program for Effective Learning/Thinking (S.P.E.L.T.) was chosen as an in-content instructional approach. It integrates the features of several prominent cognitive theorists and intervention procedures, and it emphasizes the teaching of learning/thinking strategies directly within content across the curriculum.

The effectiveness of cognitive education, represented by the I.E. and S.P.E.L.T. programs, was compared with the effects of traditional instruction at two initial grade levels (grades 4 and 7) for three diagnostic groups (gifted, learning disabled and average achievers). Specifically, the objectives of the project were fourfold:

1. to assess the relative effectiveness of the two programs in terms of their impact on students' affect and motivation, academic achievement, cognitive ability, and learning/thinking and problem-solving strategies;
2. to examine the differential effects of the programs on gifted, normal achieving, and learning disabled students;

3. to ascertain the feasibility of implementing learning/thinking strategies instructional programs on a large scale as part of the regular curriculum of schools; and
4. to identify appropriate methods for providing the level and quality of teacher training necessary for implementation.

In response to the objectives listed above, nine research questions were formulated as follows:

1. What are the relative *effects* of the different cognitive education programs compared to traditional instruction on gifted, learning disabled, and average achievers with respect to the following dimensions?
    a. perceived competence
    b. perceived locus of control
    c. performance in reading comprehension
    d. performance in arithmetic problem solving
    e. use of specific strategies employed in solving problems.
2. Is/are the training program(s) more *appropriate* at different ages for different diagnostic groups?
3. Do the pupils continue to *maintain* and/or alter their level of performance following the withdrawl of training?
4. What is the nature of strategy *monitoring* for each of the three groups across the different age/grade groupings? To what extent can the cognitive education programs be *implemented* as intended by program developers?
5 What is the nature of the strategies utilized by each of the groups across the different age/grade groupings *prior* to instruction and at the *conclusion* of the study?
6. What are parents', teachers', and administrators' *opinions* regarding the cognitive education programs?
7. What are the teachers' and administrators' *opinions* regarding inservice and consultative assistance provided for cognitive education programs?
8. What guidelines for preservice and inservice programs for teachers seem appropriate?
9. How well are the programs implemented by teachers of cognitive education? Do teachers learn and implement the cognitive education strategies? How appropriate and effective are the inservice and consultation provided?

Research Design

The study was a three-year longitudinal evaluation study implemented in two phases (i.e., phase 1: 1984 - 87; and phase 2: 1985 - 88)[1]. It utilized a repeated measures factorial design involving the three types of instructional programs (I.E., S.P.E.L.T., and Control), three categories of students (gifted, average, and learning disabled), and two initial grade levels (grade 4 and grade 7). The complete study involved four data points (repeated measures): pre-test in the fall of the initial year, and two post-tests in succeeding May/June periods corresponding to the end of grades 4 , 5, 7, and 8, and a maintenance post-test at the end of grades 6 and 9.

Program Implementation

Teachers assigned to the control condition (traditional instruction) were told to teach as usual, whereas teachers assigned to the two cognitive education procedures received inservice training from project staff prior to giving strategy instruction. Thus students in the control condition received traditional instruction, while students involved in the two cognitive education programs received a minimum of 120 minutes of strategy instruction per week over two school years. Strategy instruction was followed by one year of maintenance, during which all strategy instruction was withdrawn. Since I.E. is an out-of-content program, teachers were required to take time out of a variety of curricular content areas to implement the program. Essentially, the I.E. instruction time was taken from language arts. For S.P.E.L.T., teachers incorporated strategy instruction across content areas, and language arts was the major content medium for the S.P.E.L.T. instruction.

Summary of Results

Student Change

The results appear very promising, particularly for learning disabled students and to a somewhat lesser extent gifted students (see Table 2). The most pronounced effects were observed for the grade 4 learning disabled students, most notably in reading comprehension and related strategies. There was also evidence that the average and gifted students benefitted, but to a lesser degree. Generally, S.P.E.L.T instruction tended to produce more changes as compared to I.E. and Control. This finding was not unexpected since the S.P.E.L.T. instruction, in large part, involves teaching cognitive strategies directly within curricular content areas.

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[1] Due to budget restraints the study was conducted in two major phases. Phase I (1984 - 1987) began in October 1984 and ended in June 1987. Phase II (1985 - 1988) started in October 1985 and ended in June 1988. Thus, for each phase, it was a three-year period of evaluation. Nevertheless, for the whole study, it took four years (1984 - 1988) to complete.

The lack of consistent maintenance of behavioral change, which was sometimes observed for I.E. students, may be due to insufficient time allotted for I.E. instruction. Maintenance of the program might well be achieved if I.E. instruction could have been continued for a longer period of time.

This study is a highly conservative one, as in most cases only one or two teachers in a school, at one grade and subject level, taught either the I.E. or S.P.E.L.T. program. If all teachers at each grade level were engaged in the teaching of cognitive education procedures, quicker and more comprehensive effects would likely have emerged. There is some evidence for this expectation in a study conducted in the Barrhead-Swanhills School Division in 1985 (Mulcahy, Peat, & Darko-Yeboah, 1986). All teachers from grades 4 to 12 were trained in cognitive education procedures, with pre- and post-tests administered to students during the initial year. Significant pre-post gains were noted on measures of self-concept, perceived problem solving, metacognitive reading awareness, and strategy use.

The results obtained in the present study are also consistent with findings from recent research on the teaching of metacognitive strategies (Paris & Oka, 1986). Haller, Child and Walberg (1988) conducted a meta-analysis of twenty studies of metacognitive strategy teaching with respect to reading comprehension which involved a total of 1,553 students. They obtained an average effect size of .71 which they report as one of the largest uncovered in educational research to date. This supports the claim that metacognitive strategy teaching is effective in making children more aware of reading strategy variables.

Table 11

Summary chart of the three-year results

		Program Effect		
Variable	Grade	Learning Disabled	Average	Gifted
Cognitive Ability	4	No	No	No
	7	No	No	No
Academic Achievement				
Math Computation	4	No	No	No
	7	Yes(1)	No	Yes(1,2)
Math Concepts and Application	4	Yes(1,2)	No	No
	7	Yes(1)	No	Yes(1,2)
Reading Vocabulary	4	No	No	No
	7	No	No	No
Reading Comprehension	4	Yes(2)	No	No
	7	Trends(2)	No	No
Affective Perceptions				
Perceived Competence	4	No	No	No
	7	No	No	No
Self Concept	4	No	No	No
	7	No	No	No
Locus of Control	4	Yes(1,2)	Yes(2)	No
	7	No	No	No
Cognitive Strategies				
Reading Strategies Awareness	4	Yes(1,2)	No	Trend
	7	No	No	Yes(1,2)
Reading Cloze Performance	4	Yes(2)	No	Yes(1,2)
	7	Yes(2)	Yes(2)	Yes(1,2)
Comprehension Monitoring	4	Yes(2)	No	Yes(1,2)
	7	Yes(1,2)	No	Yes(1,2)
Math Problem Solving Strategies	4	Yes(2)	No	Yes(1,2)
	7	Yes(1,2)	No	Yes(1)
Perceived Problem Solving Ability	4	No	No	No
	7	No	No	No

1= I.E., 2=S.P.E.L.T., 3=CONTROL

Participants' Perceptions

The perceptions of parents, teachers and administrators regarding the two cognitive education programs are extremely encouraging. The vast majority of experimental teachers reported that they would continue to use the instructional procedures from the two programs. Indeed when a significant number was surveyed again in November 1988, two years after involvement in the project, over 85% of the teachers reported they were continuing to use aspects of the programs in their teaching. This was coupled with the fact that all teachers indicated they would still recommend the programs to their colleagues.

Parents' responses, although limited to the second and third years, also indicated positive changes in their youngsters, in a number of important behavioral areas such as **self-confidence, task persistence, accepting alternative points of view, originality of thinking**, and **questioning**.

Administrators' perceptions of the two experimental programs were also generally very positive. Some concern was evident with respect to the high cost of I.E. materials as well as the practice of teaching I.E. in isolation from the rest of the curriculum. However, on follow-up questionnaires, one and one-half to two years after their involvement in the initial implementation, over half of the 24 principals said they would consider adopting the experimental programs. Many of these principals stated they would also recommend the cognitive education programs to other schools.

Teacher Enthusiasm

The question of whether the programs were implemented as intended, was determined through on-site visits and phone calls. In the majority of cases the programs appeared to have been implemented adequately; however, it is clear that some teachers were implementing to a greater degree of intensity than others. Teacher enthusiasm with respect to the two particular approaches was extremely high, so it was difficult to control for the Hawthorne effect. However as has been pointed out by other researchers, it is unrealistic to expect these teachers to hide their enthusiasm. Moreover, teacher enthusiasm is useful evaluation data (Nickerson, 1986) indicating face validity of the programs.

It is also possible in the present study that the Control group's performance was enhanced as a result of participation in the project. There were some indications from control teachers to suggest this. One particular comment voiced to the principal researcher was "I bet my students will do as good or better than those students being taught strategies", suggesting that some control teachers may have viewed themselves in competition with the experimental groups. Even with the careful monitoring it is still possible that programs were not as systematically implemented as intended. In order to ensure maximum implementation it would be helpful to have peer teacher coaching made an integral part of the procedure. The first year could be a program implementation year and the following years, evaluation years.

The teachers in both experimental programs indicated the desirability for additional follow-up inservice sessions over the years. This could be handled to a considerable extent through peer coaching and staff meetings devoted to discussion of teaching procedures, and generalization over content areas and grades.

Inservice Training

With respect to the inservice training provided for the two experimental programs, the vast majority of the teachers indicated that inservice training was sufficient to allow them to implement the programs adequately. There was some indication from a number of teachers that more "in-school support" would have enhanced implementation of the programs. A feeling of isolation (being the only teacher in the school involved), was voiced on occasion by some teachers. The administrators and other staff were not familiar with the programs. Nevertheless, teachers were able to learn and implement the programs with some degree of facility. The need to have all staff become familiar and involved from the beginning of the program was evident.

Implications

Cognitive Education as a Part of School Curriculum

The results observed with respect to pupil change, coupled with the perceptions of parents, teachers and administrators, suggest that the teaching of learning/thinking strategies should be made an integral part of the school curriculum.

The question of whether the cognitive education programs are more appropriate at different grade levels or for different diagnostic groups could not be answered definitively. However, instruction at the lower grades was associated with better gains than instruction at the higher grades. The results clearly indicate that both programs have a greater effect on students at the grade 4 level. The teachers involved in the experimental conditions also indicated general appropriateness of both programs for grade 4 students. Both programs appear to be most effective for grades 4 and 7 learning disabled students and to a lesser extent for gifted students. It is somewhat puzzling that there appeared to be less impact on average students as compared to learning disabled or gifted students. This may be due to the fact that learning disabled students generally lack a systematic strategic approach to tasks and thus benefit more quickly when provided with a systematic approach. Average students may already have a somewhat effective approach in place, and thus fail to benefit significantly from the programs at the outset. Gifted students have the intellectual ability to perceive the usefulness of the strategies and then to use and extend them immediately. Many of the teachers commented that they found the higher ability students to "take off" with the strategies in extending and applying them.

Cognitive Education for Students

The results have clear implications for the mainstreaming of students with learning difficulties, as well as gifted students. The impact of the teaching of cognitive strategies on the learning disabled students, particularly at grade 4, suggests that if the teaching approaches are used systematically throughout the elementary school, it may prevent some students from developing severe learning problems, and keep them in the mainstream.

The recent research on the teaching of learning/thinking strategies to learning disabled students also demonstrates significant effect with respect to achievement (see for instance Palinscar & Brown, 1984; Paris & Oka, 1989; Goldman, 1989). The effects observed in this study for gifted students also indicate that they may benefit from such teaching in the regular classroom.

These approaches should also be effective for mildly mentally retarded as well as native youngsters in regular classrooms. Indeed some researchers have suggested this (Mulcahy & Marfo, 1987; Brown, 1984). There is a need for further research on teaching learning/thinking strategies for these populations. Further investigation into the effects of extending cognitive instruction to primary, senior high and post-secondary levels is also required. Current research at the preschool level with high risk children, appears to hold significant promise (Haywood, Brooks, & Burns, 1986; Price, 1991).

Assessment of Cognitive Strategies

The two cognitive education programs affected the cognitive strategies utilized by students after instruction as well as increased their degree of metacognitive reading awareness. The comprehension monitoring skills of students after two years of instruction in the two cognitive education programs were observed to be generally better than their control counterparts, and so was their performance on a cloze reading task. Both these tasks require students to use context to fill in missing words and to determine the comprehensibility of the text. As Paris and Oka (1986) have suggested, skimming, rereading, paraphrasing, inferring and checking are strategies that one would use on these tasks. No direct measures of these particular strategies were taken during the Cognitive Education Project. However, the changes in math strategies noted in I.E. and S.P.E.L.T. students were often those of rereading, stating plans and determining alternative solutions.

The assessment of cognitive strategies was addressed to some extent by the project. However, it may be that more pervasive strategic change could have been identified if more appropriate criterion measures of cognitive strategies were available. Further research must address the development of these instruments for researcher as well as practitioner use. The math problem solving strategy approach, the *Metacognitive Reading Strategy Awareness Inventory*, and to some extent, the *Perceived Problem Solving Inventory*, used in this study appear to hold some promise both from face validity and/or from results reported here and elsewhere.

Reflections of the Research Team

The study reported here is a very extensive one involving an extremely large number of participants. When one is involved with such a large number of individuals over an extended period of time, there is a great deal of what might be termed *qualitative* data collected which can shed further light on the study about cautions which future studies of this nature can benefit from. The following provides some of this qualitative data from the perspective of the research team. There are essentially six major topics of importance related to the study which we feel merit attention: data interpretation, inservice training, implementation, evaluation, program management, and programs.

Some Considerations Regarding Interpretation

As with any study there are significant limitations which must be considered in interpreting the results reported. Among the more critical with regard to this study are: with the large number of statistical analyses significant results by chance are increased; specific tests of program mastery were not conducted independently by the research team so it is possible that all students may not have mastered the content of the experimental programs; the majority of situations involved only one experimental teacher in a school thus restricting the instruction to one classroom of students as well as the consolidation and generalization of the learning and thinking strategies; the small number of parent questionnaire returns in years two and three restricts the degree of confidence that can be placed on these results, however, the results at the end of one year of instruction can be viewed with confidence in light of relatively high rates of return; not all students had all measures available for analysis, however, missing data due to attrition, test administration, etc., is a significant problem and is particularly a difficulty in longitudinal studies; the use of grade equivalent scores as the dependent measures in some of the analyses could be criticized.

Inservice Training

Due to the large number of requests for inservice training in S.P.E.L.T., there has been much opportunity to modify and refine the S.P.E.L.T. inservice model. As well, through classroom observations throughout the four years of the Cognitive Education Project, insights were gained as to which aspects of inservice training were applied most frequently at the classroom level. The synthesis of this information is presented below.

S.P.E.L.T.'s three-phase approach to the teaching of learning/thinking strategies appears to be more important than the choice or sequence of strategies used. This observation is strengthened by recent research articles which emphasize 'informed strategy training' (for example, see Nickerson, 1988). As well, there was a tendency for some teachers in the Cognitive Education Project S.P.E.L.T. condition to remain within the direct teaching of Phase I for extended periods of time, rather than moving to Phases II and III. In light of these factors, and based upon the responses of hundreds of teachers to the inservice training process, the inservice training model has been modified as follows:

a) Rather than spending each of the three days of training on each phase of the S.P.E.L.T. instructional model sequentially (i.e. Day 1=Phase I; Day 2=Phase II; Day 3=Phase III), the strategies are now presented in content-based clusters, with each cluster moving through the three phases. This results in teachers undergoing an experience with the S.P.E.L.T. instructional continuum a minimum of four times throughout the three-day training process. Although the number of strategies presented is reduced using this model, the importance of the instructional continuum is emphasized.

b) The emphasis on the instructional continuum, with multiple strategy clusters being presented, rather than the individual strategies, seems to eliminate the tendency of some teachers to emphasize only one area of strategy application such as reading comprehension or memory. In other words, the breadth of strategies used in classrooms appears to be greater than when the original inservice training model was used.

The five-day inservices for I.E. should be split into two- and three-day blocks in order for teachers to try the principles of I.E. before completing the entire training. In addition, two half-day workshops held at regular intervals would give teachers a chance to share problems and ideas and to renew their enthusiasm with respect to the program.

In order to ensure that teachers are able to acquire the necessary teaching skills and strategies regardless of the program, cognitive coaching should be made an integral part of the initial training. This coaching for application would involve hands-on, in-classroom assistance and cognitive modelling to transfer skills and strategies to the classroom. This could be achieved through the extended training of classroom consultants who could then work with teachers in the classroom on a continual basis after the initial inservice training. Peer coaching should also be made an integral part of the inservice training and extended into the classroom situation.

Implementation

When future studies of this nature are considered, it would be more appropriate to have the initial year as an implementation year where teachers are trained and monitored through the year and the coaching is developed as an integral part of the program. The succeeding years would then become evaluation years which would result in less confusion and more direct evaluation of program effects.

When inservice training pre-testing and implementation are all occurring at the same time, teachers, students and administrators as well as the research team are dividing attention and efforts towards many variables and as a result one or more of these areas suffers. If participants are able to concentrate on one aspect at a time, it is likely that more appropriate implementation might occur. Allowing the initial year to enable teachers to concentrate on implementing the procedure would result in less confusion.

This would also enable the research team to engage in more in-class coaching and monitoring to assist in more appropriate implementation. This raises another problem that we ran into in the implementation which was a major concern for the teachers as well as for the research team. The feedback from a number of teachers in the field indicated that they felt they were being torn in a number of directions simultaneously and thus were unable to put forth a concentrated effort to the implementation. One issue was that many districts had a particular focus one year with respect to the teaching and enhancing effectiveness and the next, a new thrust or focus would emerge. An example might be the emphasis on teacher effectiveness training and then next year focus on increasing students' self-esteem. What this tended to do was restrict teachers in the ability to implement the strategy teaching consistently over the years with a focused thrust. The comment was often heard, "we are being asked to do too many things at the same time with not a long enough period with any one focus to enable us to do the task adequately". The research is clear that the teaching of learning/thinking strategies is not a brief task but one that requires a long–term commitment over a number of years.

The experience gained through implementing this project pointed out a number of pitfalls that need to be avoided when schools or school systems contemplate putting in place a program of learning/thinking strategy instruction. Some of these have also been documented by Chance (1986).

There was often a tendency to move too fast or try to do too much in a short period of time. It was evident that in many instances too many cognitive strategies were attempted to be taught in a very short time. It is important to focus on a few strategies over the course of a year or term and teach them well.

It appeared in many cases that expectations for change were to high. The expectation of significant changes in a short period of time could have led to some disenchantment and the abandonment of the teaching or at the most a halfhearted effort. Cognitive strategy instruction is a long-term commitment and must be viewed as such.

Giving in to early failures can be a common problem. Instead of viewing these as failures, it is important to treat them as opportunities to learn more about cognitive strategy teaching. In these early stages of the development of cognitive instruction, mistakes and failures are to be expected and can be the vehicles to adding to our knowledge regading how best to deliver cognitive education instruction. Just as we encourage students to use errors in their problem solving to assist them in their learning, so too should teachers of cognitive education.

Program Management

Record keeping, collecting and scoring tests, and computerizing results were onerous tasks. The recording of what decisions had been made and why with regard to testing, inservice, questionnaire distributions, scoring, student attrition, assessment difficulties, and missing data to list but a few is a full-time job. It is necessary to keep very careful written records of dates, times, decisions and individuals involved in order to be able to interpret study data in a realistic way. This is something that we in the study team did as consistently as possible. However, there were still times it was not totally clear what had happened and why.

Communication in a project of this nature is one of the key elements which can make or break the study. It is essential that all major participants are kept informed from beginning to end with respect to all aspects of the study. With a study of this magnitude, this is an extremely difficult task. At the very beginning in order to make as explicit as possible each participant's role, a summary was written up of the project including questions to be addressed along with methodology. The particular roles and responsibilities of the school jurisdiction, teachers, and research team were clearly laid out and presented to participants prior to involvement. A signed written contract from the participating school jurisdictions was then requested to ensure as much as possible the continued commitment for the three-year duration of the study.

As well, some meetings were held with school boards, parents, and/or administrators to communicate the study's intent. In future studies, meetings of this nature should be an integral part of initial program management to ensure communication is appropriate and to address any questions or concerns.

Over the course of the study it is essential to ensure ongoing communication between the research team and field. We attempted to do this by requesting one contact person (usually an assistant or associate superintendent) to be assigned to communicate with the research team and teachers. As well, through phone calls and newsletters we tried to keep as close contact as we could (with schools up to 80 to 100 miles away) with teachers in the field. This was still not adequate. In future, it may be useful to use a computer networking system with the schools and set up electronic bulletin boards where sharing of information could occur between the team and the field as well as between teachers in the field involved in the same program. This would allow a sharing of ideas with respect to program implementation as well as keeping focus on the implementation.

Following a small number of children out of a total classroom is extremely difficult, particularly over more than one year. Testing becomes disruptive to the entire class and teachers are unable to conduct group testing easily as they have to divide their time between those students being followed and the rest of the class.

When following these students into the next grade, significant difficulties were encountered with respect to both students and teacher. Typically students are reassigned to classrooms at the end of each year which means that a new group of students is formed each year. Thus some of the students have been taught the program for one year whereas others have no knowledge whatsoever. In the project we attempted to have students move as a complete group to the next class, however, this was only achieved in a very small number of cases at grade 4. If this was not possible then those students who were being followed were kept together as a group in their new class. The teacher then reviewed the previous year's work emphasizing those aspects crucial to the program movement to the next level. Identifying teachers at the beginning who would become involved in the second year and training them in the initial year would be extremely helpful in having teachers ready to teach the next level of the programs. In this study, only a few teachers were trained in this manner; teachers do not have full control over their staffing placements. If all teachers were involved, this would not be as much of a problem.

All of the testing would best be done by the research team to ensure consistency as well as greater validity and reliability of data. Teachers might best administer only those tests directly usable and interpretable by them.

Evaluation

In studies of this nature, the question of the most appropriate criterion measures is a major concern. We attempted to evaluate the program from a number of perspectives including the cognitive strategies employed by the students. There is a need in the continuing work of this nature to further develop instruments and techniques more sensitive to the development of learning/thinking strategies and their transfer.

In evaluating the implementation it is obvious to us that we have not been able to detect changes that may have occurred. Teachers would often comment that the implementation of the programs had positively changed their teaching style and the way they now viewed and interacted with their students. Many teachers teaching Instrumental Enrichment for example, indicated when visited in their classrooms that students who previously would not volunteer an answer in class or debate a point would now do so, thus increasing their confidence in their work. It would be extremely beneficial in future research to attempt to objectively document these reported changes both through classroom observation as well as test-retest data. This was not directly observable from our measures. The development of a classroom interaction scale evaluating those student–teacher as well as student–student behaviors one would expect should change as a result of the strategy instruction would provide an important evaluation component which has been missing from intervention studies in the teaching of cognitive strategies.

In further studies attempt should be made to determine differential impact with respect to quality and degree of program implementation as it appeared obvious that some teachers were clearly implementing with greater enthusiasm and commitment than others. This might be built into the initial design as a major factor to be evaluated.

As this study progressed we became aware of new instruments which may in future be excellent criterion measures of program impact. One such measure is the *Learning Process Questionnaire* (LPQ) (Biggs, 1985). This particular instrument evaluates students' learning motives and strategies in an interactive way and thus may be a very good measure of changes in motivation and strategy as a result of program implementation. *The Structure of the Observed Learning Outcome* (SOLO) (Biggs & Collis, 1982) method of determining students' levels of thinking in different content areas also appears to warrant consideration as an approach for evaluating students' learning with respect to the teaching of learning thinking strategies. These measures should be explored along with others in future studies of this type.

One acceptable measure of program impact is the degree of interest generated as the project progresses and the willingness of other groups and individuals to commit resources and time to the program. There was a significant increase in interest exhibited locally, nationally and internationally by teachers, administrators, and researchers which has continued to grow. It is obvious that the study has now progressed to the diffusion stage where the teaching program (particularly S.P.E.L.T.) is now being incorporated at a variety of levels in different school systems and universities.

Programs

The experience gained from working intensively with the two different programs was invaluable. The difficulties we encountered with implementing a program which takes time away from the content were many and varied. One major difficulty was with the conflict teachers felt with respect to covering the curriculum in order not to detract from their students' performance on year end tests . The felt need to cover the curriculum content was so great that in many instances, it was obviously detracting from the implementation of the program in terms of time allocated as well as focus. This was particularly a problem with respect to Instrumental Enrichment but was also voiced by some teachers with respect to S.P.E.L.T.

A large percentage of teachers voiced their concern that their students were not being tested with respect to learning thinking skills but rather on acquired knowledge of content and thus teaching learning/thinking skills had to be secondary to teaching factual knowledge with respect to curriculum content. If teaching learning thinking skills is to become an integral and focused part of the classroom teaching, then assessment of the acquisition and application of learning/thinking strategies must become a part of the evaluation of curriculum in schools. Until it is obvious that this is the case, the teaching of learning/thinking strategies will take a backseat to attempting to cram as much factual information as possible in order to answer content-based questions, thus contributing to the futile acquisition of "inert knowledge" which is adequate for the test but fails to be applied or evaluated beyond curriculum content. This is not to suggest that teaching content is not important but rather a more prominent role will need to be given with respect to teaching the process of learning thinking. Content teaching is indeed important for one needs to think about something.

Both the research team as well as teachers implementing the two programs observed that it may well be that the principles of the Instrumental Enrichment Program might be utilized with some students displaying particular cognitive deficits at initial stages and then the S.P.E.L.T. procedures could be brought in to further extend the principles developed through I.E. There might thus be a blending of both programs with S.P.E.L.T. assisting extensively in the bridging and extending of strategies to content areas.

Some teachers indicated that they would like to see the principles of teaching found in Instrumental Enrichment to be more freely allowed to be adapted or extended beyond the actual exercises and that the more important component was the mediated style of teaching. The program might well benefit from further development in a broader context.

Recommendations

Based upon the results of this study the following recommendations are made.

Alberta Education

1. It is recommended that Alberta Education make the teaching of cognitive education procedures an integral part of the Alberta school curriculum for elementary and junior high students and, that this become policy. The vast majority of experts in the field indicate this should be integrated into content teaching. The results of this study would support this.
2. It is recommended that Alberta Education develop and make available appropriate resource materials for teachers to use in the teaching of cognitive education procedures.
3. It is recommended that Alberta Education develop and make available to teachers and school administrators cognitive strategy assessment instruments in differing content areas as well as affective domains. These should be appropriate for both formative and summative evaluation purposes. This assessment might be made as part of Alberta Education's ongoing program of testing for school jurisdictions.
4. It is recommended that Alberta Education make available to all its field consultants training opportunities in theory, research, and application issues relating to cognitive education procedures.

Universities

1. It is recommended that teacher training programs in Alberta provide compulsory training in the principles and practice of cognitive education for all preservice teachers.

School Jurisdictions

1. It is recommended that inservice training be made available with respect to methodologies for teaching and evaluating learning thinking strategies in classrooms.

Joint University, Alberta Education and School Jurisdictions

1. It is recommended that a Cognitive Science Unit be established which would have the following as its major functions:

(i) the inservice training of teachers;

(ii) assisting in the development and implementation of preservice training courses at the university level;

(iii) providing consultation to school systems regarding implementation and evaluation procedures;

(iv) conducting basic and field research on the teaching and assessment of cognitive education procedures.

The setting up of this unit should initially be a joint endeavor between Alberta Universities, Alberta Education, and school jurisdictions.

2. It is recommended that additional research be conducted regarding the efficacy of cognitive education procedures at primary and secondary levels as well as with different populations, particularly the mildly retarded and native students. There is at present little systematic research on the effectiveness of these approaches for these students in mainstream classrooms.

Concluding Remarks

Education has tended to easily embrace new instructional approaches, the most recent one being learning/thinking strategy teaching or in somewhat more popular terms "metacognitive instruction". This type of instruction, regardless of which particular program is used, attempts to teach students to plan, implement, monitor and evaluate specific strategic approaches to tasks. The recent literature, including this study, suggests that this type of instruction has the potential to make enduring positive changes with respect to student learning and problem solving (see for instance; Haller, Child & Walberg, 1988; Paris & Oka, 1986; 1989; and Palinscar & Brown, 1987). It is likely that no one particular, added-on program, at one instructional level, will provide the adequate emphasis needed. In fact, some experts in the field suggest that it may not be ***what*** you teach (in terms of particular strategies or materials used) but ***how*** you teach it that is most critical to positive student change (Nickerson, 1988). Many teachers in the study reported here would also support this view.

The results of this study are very encouraging. There are potential benefits to students and teachers of implementing cognitive education procedures in mainstream elementary and junior high school classrooms. The study here suggests that a number of positive changes in student behaviors do occur for different types of learners. The approaches examined in this study are only two out of a wide variety available (see Appendix A) and these two might best be viewed as initial attempts at teaching learning thinking which do hold some promise. Further development and evaluation however are still necessary.

There are numerous questions still to be answered within the context of this particular study including developmental and individual differences of the different groups of students with respect to strategy and effect. As well, questions regarding more specific subgroup differences with respect to program impact are still left to be answered (e.g., those high in self-concept versus low, those high in external locus of control versus low, etc.). As well, examining subgroups of students who appeared to benefit to a greater degree than others and then attempting to determine why this is the case would provide additional insight into differential effects of program impact. These and other analyses would help to provide a more comprehensive picture leading to a better understanding of the specifics involved in this type of intervention. There are also many questions yet to be answered in future work including: How quickly should one introduce a new strategy? What is the most powerful way to obtain transfer and generalization? What is the best way to interface content and strategy? What is the most appropiate way to integrate affect and cognitive strategy teaching?

Despite the problems and unanswered questions we need to pursue metacognitive instruction in our classrooms. There is clearly the need to provide for a comprehensive integrated approach to the teaching of cognitive strategies across all levels of education beginning at kindergarten through to post-secondary. The most appropriate ways of doing this to enhance learning/thinking have yet to be determined. However, we do now know enough to begin to make a start.

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APPENDIX A

Learning/Thinking Programs

APPENDIX A

THINKING SKILLS PROGRAMS

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
Thinking related to learning, recall, and use of information	*Techniques of Learning,* Donald Dansereau, Texas Christian University Fort Worth, TX 76129	To teach students effective easy-to-use techniques for mastering academic information, especially in text.	Offered as a one-semester course consisting of 7 units. Each unit explains, demonstrates and provides practice in the use of one or more techniques. Offered primarily to college students, but some modules may be suitable for use with high school students.
Problem solving and intellectual modelling (heuristic) skills	*LOGO,* Seymour Papert, MIT	To teach children some important math concepts as well as problem solving skills by teaching them to program computers, using the LOGO programming language.	In the beginning stages of instruction, children write programs that direct the activities on the screen of a cursor, called Turtle. The computer graphics that the Turtle draws on the screen may then be manipulated in various ways.
Learning-to-learn Skills, content thinking skills and reasoning skills	*Tactics for Thinking* (McREL) Robert J. Marzano and Daisy E. Arredondo, Mid-continent Regional Educational Laboratory, Aurora, Colorado & Kansas City, Missouri Published by ASCD	To teach students skills of refocusing, awareness, responsibility, goal-setting and problem solving	Taught to students through 23 units divided between thinking skills frames of, (a) Learning-to-learn (b) Content thinking (c) Reasoning skills Intensive inservice for teachers.

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
Intelligence Education	*S.O.I.* Drs. Mary and Robert Meeker 343 Richmond St. El Segundo, CA 90245 (Based on J.P. Guilford's structure of Intellect model)	Improving the information processing skills of learners. Career counseling information available. In figural, symbolic, and verbal forms, skills include: Cognition Memory Divergent production (creative thinking) Convergent production	Individual assessment of cognitive skills provide the basis for the preparation of a diagnostic/prescriptive remediation and enrichment plan. While exercises are extra-disciplinary, the use of the *S.O.I. Learning Abilities Test* provides valuable recommendations on student performance on content objectives. Intended audience: Pre-school to adult. Evaluations: re-testing on the alternate form of the *S.O.I. Learning Abilities Test.*
Identifying and Modifying the Learning Process	*Instrumental Enrichment (IE)* Reuven Feuerstein University Park Press, Baltimore Professional Training: Dr. Francis Link CDA Inc. 1211 Connecticut Ave., NW, Suite 414, Washington DC 20036 Sylvia Lee Canadian Learning Resource Centre 4th Floor, 22 St. Clair Ave. East, Toronto, Ont. M4T 2S3	Developing student awareness of the learning/problem solving process and omissions which create errors or misconceptions. Instruments include: Nonverbal Organization of dots Analytic Perception Illustrations Limited Vocabulary Spatial Orientation Comparisons Family Relations Numerical Progressions Independent Reading Categorization Instructions Temporal Relations Transitive Relations Representation Stencil Design Logical Reasoning	Analysis of figural and verbal problems using discussion to describe the process. Extra-disciplinary exercises. Program designed for adolescents, but also used in upper elementary and middle school classrooms. Evaluation: Selection of commercial tests varies, but observation of student behavior is commonly practiced.

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
Piagetian or Experiential Methods (learning activities based on children's intellectual development stressing experience and the use of concrete, semi-concrete, and abstract tasks)	*Early Prevention of School Failure* Lucille Warner Peotone School District 207-U 114 N. Second St. Peotone, IL 60468	Modality training for gross and fine motor development, visual and auditory discrimination, and language skill.	Diagnostic/prescriptive activities with screening instruments, management guides, classroom activities, and parent materials for students 4-6 years old. Pre-post assessment instrument prepared by developer. J.D.R.P. validated.
	British Primary Schools materials *Nuffield Mathematics* John Wiley, N.Y. MacDonald Science Series Pernell Educational 850 Seventh Ave. New York, N.Y. 10019	Science and mathematics concepts relying on observation and measurement.	Teacher materials for conducting and organizing science and mathematics instruction in British Primary Schools. For students 5-13 years old. Evaluation by observation of student behavior.
	Alpha II Program 2425 Alamo SE Albuquerque, NM 87106	Piagetian skills: Conservation Classification Seriation Number and space perception	Small-group administration of Piagetian assessment instrument allows small-group implementation of Piagetian tasks. Manipulatives, lesson cards, a management plan, and questioning strategies are provided. Assessment by use of a diagnostic form and observation of student behavior.
	Comprehensive School Mathematics Program Claire Heidema 470 N. Kirkwood St. Louis, MO 63122	Classification, elementary logic and number theory.	Experiential, but not strictly Piagetian, approach to teaching mathematics by a spiral curriculum. J.D.R.P. validated for grades K-6. Pre-post assessment instrument prepared by developer, also evaluated by *C.T.B.S.* and *Stanford Achievement Tests.*

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
	Cognitive Level Matching Project Martin Brooks Shoreham Wading-River Central School District Shoreham, NY 11786	Use of instructional methods appropriate to students' intellectual development as defined by Piaget. Extensive staff development was provided in recognizing and integrating Piagetian methods.	Implemented K-12 in academic subjects. Evaluated by teacher assessment of students' explanation of reasoning and by Piagetian tests.
Perceiving Relationships (Analysis Skills)	*Strategic Reasoning* Innovative Science Inc. Think Program Park Square Station, P.O. Box 15129 Stamford, CT 06901	Skills include: Thing making Qualification Classification Operation Analysis Component Analysis Analogy	Media kits and student workbook. Middle School through high school levels. THINK II is content related; other activities are extra-disciplinary. Assessment by cognitive abilities tests.
	Building Thinking Skills I, II, III Midwest Publications, P.O. Box 448 Pacific Grove, CA 93950	In verbal and figural form, skills include: Similarities and Differences Classification Analogy	Book I is designed for middle elementary grades; Book II, upper elementary grades; Book III, Junior high school. Items are Sequencing drawn from content are vocabulary, hence seems content related. Teacher's manuals provide explanations of tasks, enrichment or preparatory activities, and guidelines for discussion. Assessment - *Cognitive Abilities Test* or *DCAT*. Criterion referenced tests can be designed by following references to corresponding items provided in the teachers manual.

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
	Critical Thinking In History Project Kevin O'Reilly Hamilton-Wenham Regional High School 775 Bay Rd. S. Hamilton, MA 01982	Skills include: Evaluation of evidence Evaluation of value statements Logical Thinking Types of Reasoning Fallacies in History Analyzing arguments	Supplemental logic course for U.S. history instruction (colonial period, new republic, republic to Civil War period, and reconstruction to progressivism period). Each unit includes a student guide, worksheets, debate and analysis guide, and interpretations to history for student analysis. Evaluation includes the content and length of student essays, student attitude questionnaire, and the *Cornell Test for Critical Thinking*.
Implementing Thinking Skills Instruction in the Content Areas	*Project Impact* Orange County Superintendent of Schools Lee Winocur, Director P.O. Box 9050 Costa Mesa, CA 92626	Skills organized in a hierarchical sequence are presented and abstract learning units. Skills include: Classifying and categorizing Ordering, Sequencing and Prioritizing Patterns and Relationships Fact and Opinion Relevant and Irrelevant Information Effective Questioning Understanding the Meaning of Statements Cause and Effect Making Generalizations Forming Predictions Making Assumptions Identifying Point-of-View Logical Reasoning	Designed for junior and senior high school students, lessons include direct instruction activities for students and thorough lesson plans for teachers J.D.R.P. validated. Assessment: *C.T.B.S.* and *Cornell Test for Critical Thinking.*

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
	Learning to Learn Marcia Heiman Box 493 Cambridge, MA 02138	Skills common to the internal dialog of good learners: Raising and testing hypothesis Breaking complex ideas into Manageable parts Feedback and correction Directed learning behavior to content	Series of learning strategies designed to help students think actively while engaged in content learning. Used with junior high grades through college years. Assessment: G.P.A., course achievement, and content retention.
Creative ("Lateral") Thinking and Problem Solving	*Cognitive Research Trust* (CoRT) Pergamon Press Fairview Park Elmsford, NY 10523	Problem solving strategies focus on: Breadth Organization Interaction Creativity Information and Feeling Action	Student exercises ("courts") with teacher's handbook containing methods, practice items, research results, teaching notes. Elementary, secondary, and college use; and ability level.
Developing Creative Thinking Skills (Activities based on E. Paul Torrance's definitions of skills)	*Institute for Creative Education Educational Improvement Center* Box 209, Rte 4 Sewell, NJ 08080	Skills include: Fluency Flexibility Originality Elaboration	Elementary and secondary manuals offer student exercises which are related to content objectives and may be used at any grade level and with any ability group. Assessment by the *Torrance Tests of Creative Thinking*, validated for grades 4-6.
Talent Development as a Content Learning Component	*Talents Unlimited* Title IV-C ESEA Florence Replogle 1107 Arlington St. Mobile, AL 36605 (Based on Calvin Taylor's multiple talent theory)	Skills include: Academic skills Productive thinking Planning Communication Forecasting Decision-making	Exercises are related to content objectives. Elementary grades; all ability levels.

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLOGY
Creative Problems Solving	CPS Creative Education Foundation, Signey Parnes, Director, Buffalo, NY (Materials are available from D.O.K. Pub. P.O. Box 605 East Aurora, NY 14052	Students follow a process to solve personal, organizational, or hypothetical problems. Steps include: Sensing problems and challenges Fact finding Idea-finding Solution-finding Acceptance-finding	Exercises are designed for all grades and ability levels. Applies to futures studies, the Future Problem Solving competitions at the state and national levels are evaluated by an extensive review process.
Decision Making Programs	*Critical Analysis and Thinking Skills* Dr. Terry Applegate Salt Lake City, UT	Objectives include: Rational decision making Constructive criticism Identifying & solving problem Skills include: Clarification of terms Information gathering Discriminating fact from opinion Determining adequacy of authority Determining Bias Identifying relevant information Testing consistency Criticism Developing questioning strategies	Instruction may be integrated into existing high school social studies courses for one semester or taught as a separate course. Validated by J.D.R.P. Curriculum package includes inservice materials, teacher manuals, and evaluation instruments.
	Guided Design Charles Wales Engineering Sciences West Virginia Univ. Morgantown, WV 26506	Solving Problems Finding a cause of a problem Anticipating potential problems Identifying & prioritizing problems	Materials are available at college levels. Some field testing has been done for secondary use. Use of the model is district designed in content areas.

DEFINITION OF COGNITIVE SKILL	PROGRAM	OBJECTIVES	METHODOLOGY
General (thinking) strategies ("thinking guides")	*Productive Thinking* Martin V. Covington, Univ. of California at Berkeley Publishers: Charles E.Merrill Pub. Co.,1300 Alum Creek Dr., Columbus, OH 43216	To teach use of thinking guides helpful in productive thinking Grades: 4-9	Students read 15 booklets with comic book format, and practice thinking guides by answering questions confronting story characters. Class discussion of booklet exercises. Usually taught in one semester. Primarily 5th and 6th grade students; suitable for all but the slowest students. Formal training of teachers not necessary.
Abilities, methods, knowledge, and attitudes--through dialogue and discovery learning.	*Odyssey* Developers: An international team of about 50 American and Venezuelan psychologists, educators, and government officials. Publisher: Mastery Education Corp., Watertown, MA 02172	To teach skills (target abilities) needed for a wide variety of intellectual tasks. Includes creative thinking skills, but emphasis is on reasoning	Ninety-nine 45-minute lessons organized into 6 books. Students have 3 or 4 lessons per week over a period of two years. Lessons include dialogue and written exercises. Fourth through sixth graders able to read the materials.
Analytical skills	*Problem solving and Comprehension*, Arthur Whimbey Independent Consultant, Daytona Beach, FL. Pub.: Franklin Institute Press, Box 2266 Philadelpia, PA 19103	To teach the kind of careful systematic, analytical thinking characteristic of academically successful students.	Students work in pairs on problems and then compare their efforts with model solutions. Usually offered as a one-semester course to college freshmen and college-bound high school students. Intended primarily as a remedial program for students who are marginally qualified for college work.

DEFINITION OF COGNITIVE SKILLS	PROGRAM	OBJECTIVES	METHODOLGOY
General and specific meta-cognitive strategies (skills)	*A Strategies Program for Learning/ Thinking* (SPELT) Mulcahy and Associates, Univ. of Alberta, Edmonton, T6G 2G5	To train children to become active and purposeful learners, thinkers and problem solvers through carefully selected perceptual, memory and problem solving strategies within curriculum and across curriculum.	A continuum of 3 phases: I. Teacher-controlled strategy instruction II. Develop student ability to evaluate, modify, and extend present strategies III. Students monitor, and generate their own strategies. A number of selected cognitive and meta-cognitive strategies. Content of existing curriculum is used as the vehicle. Intensive inservice training for teachers.

Prepared by:
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APPENDIX B

Teacher Background Questionnaire

TEACHER BACKGROUND QUESTIONNAIRE

Name ____________________________ [ ]Male [ ] Female

Age [ ] 20-25 [ ] 26-30 [ ] 31-35 [ ] 36-40 [ ] 41-45 [ ] 46-50 [ ] 51-56

School____________________________

Year of initial certification ____________________________

Total number of years in **active** service since initial certification______________

Grade level currently taught ____________________________

Grade levels taught previously (Please indicate in brackets after each grade level listed the number of years of teaching at that level). ____________________________

____

____

Professional Training

Please list all levels of professional training received, indicating the institution attended and the duration of training in each case.

Level & Type of Training	Institution	Duration

1. (a) Have you received any training or taken any courses in Special Education?__

(b) Please list Special Education courses taken____________________________

____

____

2. Have you taught, or are you currently teaching in a Special Education setting?__

3. Please specify any other specialized training you have received______________

____

____

4. (a) Prior to your involvement in this project were you familiar with learning-thinking strategies program/procedures such as de Bono's, Deshler's Feuerstein's, or Meichenbaum's?

[ ] Yes [ ] No

(b) If your answer to the last question was "yes," specify which procedure(s) you were familiar with: ____________________________

____

(c) When did you first learn of the procedure(s)? ____________________

____

(d) State which of the procedures you have taught before, indicating how long you (have) taught it/them and to what categories of students ________________

____

____

____

5. (a) Have you ever tried any other strategy training procedure/program in your classes?____

(b) If your answer to the last question was "yes," describe the specific strategies and/or the related program(s), indicating how long you (have) taught them and to what categories of students ______________________________

____

____

____

APPENDIX C

Classroom Observational Forms

OBSERVATIONAL SHEETS

COGNITIVE EDUCATION PROJECT

CLASSROOM OBSERVATION FORM - S.P.E.L.T.

School: ____________________ Teacher: ____________________ Grade: ____

Observer: ____________________ Date of Observation: ____________________

Subject: ____________________ Topic of Lesson: ____________________

Phase I ___ II ___ III ___

Teaching steps that may be present in a given lesson:

1. Direct teaching of Strategy (Phase I)
2. Mutually setting the stage:

   Goal Identification,
   clarification
   Task definition
3. Examination of existing strategies
4. Application of modification of existing strategies, or creation of new strategies
5. Techniques to enhance memory, generalization, and/or maintenance of strategies developed

---

Teacher behaviors that may be present in any given lesson:		Follow-up/ Suggestions
1. Wait time:		
2. Socratic Dialogue: Accepting, building upon, integrating, and extending students' ideas through active student participation		
3. Ensuring clarity of communication		

INSTRUMENTAL ENRICHMENT LESSON OBSERVATION FORM

Teacher ______________________________ Date ________________________

School ____

Instrument and page _______________No. of students _________________

1. INTRODUCTION: From ___Until ___ Total time ___ (Criterion 10 min. + 5)

___ 1. Was there comparison to other work? No___ Yes___

___ 2. Vocabulary/Concept Formation No___ Yes ___

a. introduced or reviewed ____________________________________

b. well-defined____

c. students define ____

d. examples ____

e. student examples ____

f. related to page ____

___ 3. Definition of problem(s) (What do we have to do on this page and analysis of the tasks). No___ Yes ___

a. reading/explaining the task or instructions by teachers only __________

b. students contribute ____

c. thorough focus on problem and new variations on the page _____________

___ 4. Anticipation of difficulties (What difficulties may we have working this page and why?). No ___ Yes ___

a. by teacher only ____

b. by students ____

c. what is the source of difficulty _______________________________

d. why is it difficult ____

___ 5. Strategies and/or cues developed for page (processes of solution). No___Yes__

a. by teacher only ____

b. by students ____

c. various strategies developed __________________________________

d. why will they work ____

e. what cognitive functions are involved ___________________________

f. self-checking reminders______________________________________

___ 6. Principle: No___ Yes ___

a. introduced ____

b. examples given (in brief)______________________________________

___ 7. Questions:

a. Does the teacher vary across 2 or more levels? No___ Yes___

Levels:

1. Information gathering questions____________________

2. Relational questions ____________________

3. Open-ended questions ____________________

b. Does the teacher use "probes"? No___ Yes ___

___ 8. Mini summary used? No___ Yes ___

II. INDEPENDENT WORK PERIOD From ___Until___Total time___(Criterion 20 min.)

___ 1. Students' attention focused? No___ Yes ___

a. few ____________________

b. most ____________________

c. all ____________________

___ 2. Was the work of students checked? No ___ Yes ___

a. by teacher ____________________

b. by students ____________________

___ 3. Were students who needed it helped? No___ Yes ___

a. by teacher ____________________

b. by students ____________________

___ 4. Strategies and cues developed? No___ Yes ___

a. by teacher____________________

b. by students ____________________

___ 5. Insight developed? No ___ Yes ___

a. by teacher ____________________

b. by students ____________________

___ 6. Were activities provided for students who finished their work early?

No ___ Yes ___

III. DISCUSSION From___Until___Total time___(Criterion 15 min. + 5).

___ 1. Discussion of how the problems of the page were solved. No___Yes___

a by teacher only ____________________

b. by students ____________________

c. difficulties discussed ____________________

d. processes discussed ________________________________
e. various processes accepted ____________________________
f. correct answers analyzed _____________________________
g. error analyzed ___________________________________
h. alternative solutions introduced (even if only 1 correct answer)______
i. functions required_________________________________
j. most efficient strategy _______________________________

___ 2. Was there a connection to the main principle No ___ Yes ___
a. present ____
b. clear ____
c. related to Sections I & II_______________________________

___ 3. Were bridges used? No___ Yes ___
a. by teacher ____
b. by students ________ spontaneous ______________________
c. appropriate to principle _____________________________
d. across 2 or more areas ______________________________

(academic, home, interpersonal, vocational, other IE instruments).

___ 4. Questions:
a. Does the teacher vary the questions across 2 or more levels? No___Yes___
Levels:
1. Information gathering _____________________________
2. Relational _______________________________________
3. Open-ended ______________________________________
b. Does the teacher use "probes"? No___ Yes ___

IV. SUMMARY From___Until___Total Time___(Criterion 5 min+2).

___ 1. Summary Present
No___ Yes ___

___ 2. Students contribute
No___ Yes ___

___ 3. Did it connect the principle? No ___ Yes ___
a. to the page ____________________________________
b. to the bridging _________________________________

___ 4. Mentioning of processes used to work the page
No___ Yes ___

V. GENERAL CHARACTERISTICS (entire Lesson)

___ Praises
a. seldom ____________________
b. sometimes ____________________
c. often ____________________

___ 2. Accepts
a. seldom ____________________
b. sometimes ____________________
c. often ____________________

___ 3. Rejects
a. often ____________________
b. seldom ____________________
c. sometimes ____________________

___ 4. Pacing - appropriate
No___ Yes ___

___ 5. Was blackboard (other aids) used efficiently?
No___ Yes ___

___ 6. General atmosphere pleasant?
No___ Yes ___

___ 7. Was the student/student interaction constructive (with students evaluating, explaining, expanding on each others work)?
No___ Yes ___

COGNITIVE EDUCATION PROJECT

1. Can you name three children for whom the program is working well? Why? Characteristics?

2. Can you name three children for whom the program is not working well? Why? Characteristics?

3. In general, do you find that the program works better with one particular group of children than with another group? Why? Characteristics?

4. 2nd year teachers:
   Do you see any differences in (a) how receptive this year's class is as compared to last year's?

   1st year teachers:
   (b) Do you feel that you have progressed farther in curricular implementation this year due to the program?

5. Give me the exact amount of time devoted to the program - length of classes/ number of classes.

APPENDIX D

Assessment Tools

Group Assessments:

Cloze Task- 15 minutes

Error Detection Task - 10 minutes

Metacognitive Reading Questionnaire - 10 minutes

Affective Measures - 40 mins. - 1 hour

Canadian Achievement Tests -

Canadian Cognitive Abilities Test -

INSTRUCTIONS FOR AFFECTIVE TEST PACKAGE

Coopersmith Inventory Test #1

"Today you will be filling out a questionnaire. Your answers will help me know you and your likes and dislikes better. Read each question and pick the answers that best describe you. Fill in the letter which matches your answer on the accompanying answer sheet. There are **NO RIGHT OR WRONG ANSWERS**, just choose the one that best describes you."

Locus of Control Test #2

"This is a questionnaire to let us know how you feel about certain things. Read the questions and pick the answer that **BEST** describes what happens to you or how you feel. Fill in the letter which matches your answer on the accompanying answer sheet. There are **NO RIGHT OR WRONG ANSWERS**, just choose the one that best describes you or how you feel."

Harter Test #3

"We are going to answer some questions today to find out what you are like. In all of these questions you have to decide whether you are like the person described on the left side of the page or like the person on the right. Now let's try a few examples to see if you understand what you have to do.

Some kids would rather play outdoors in their spare time. But other kids would rather watch T.V. Decide whether you are more like the person on the left who likes to play outside or like the other person who likes to watch T.V. Now are you sort of like that person or really like that person. Sort of means that you would "kind of" rather watch T.V. than play outdoors. If you choose "really" this means that almost all of the time you would rather watch T.V. than play outdoors.

N.B.: Mark your answer either A, B, C or D on the computer sheet. (Only one letter answer per question.) Example questions are marked on Number 51 & 52 of the answer sheet.

Remember there is **NO RIGHT OR WRONG ANSWER** for any of these questions. Begin answering question 1 on the score sheet at #1."

Metacognitive Reading Awareness Questionnaire#4

"Now we want you to answer some questions about what you think about reading. This is not a test, we just want to know your opinions about reading. Read each question and fill in the letter of the answer that is best for you, on the computer sheet. There are **NO RIGHT OR WRONG ANSWERS**, just choose the one that **BEST** describes what you think about reading. Only fill in one answer for each question.

Cloze Task

Administration directions (students received a trial story for the first year for Phase I and Phase II group).

"This story that I want you to read is like a puzzle. Some words are missing, and you have to figure out what they are. Every time you see a blank, you should try and find a word which fits into that blank and will make the sentence and story make sense. ONLY ONE WORD IN EACH BLANK."

Give 15 minutes to complete.

Levels

Grade 4	(LD)	Story A	Grade 7	(LD)	Story D
	(N)	Story B		(N)	Story E
	(G)	Story C		(G)	Story F
Grade 5	(LD)	Story B	Grade 8	(LD)	Story E
	(N)	Story C		(N)	Story F
	(G)	Story E		(G)	Story G
Grade 6	(LD)	Story C	Grade 9	(LD)	Story F
	(N)	Story D		(N)	Story G
	(G)	Story E1		(G)	Story H

Story A

Some people love to dig into the past. Often they do so with ______. In the south of Italy, near ______, a whole city was found.

The ______, Pompeii, had been near a volcano. This ______ is called Mount Vesuvius. About two ______ years ago, Pompeii was bustling with ______. There were many lovely houses and ______. Then in the year 79 A.D., the ______ erupted. It poured hot lava for ______ around. Many people did not have ______ to get away. They died under the ______. The entire city was buried. The ______ cooled and became ash. For a ______ time, Pompeii was forgotten.

After it was ______, all the lava was dug ______. All the streets, the houses, and the shops could be seen as they were before the volcano erupted. No one lives there now, but many people visit to see what a city near Rome looked like two thousand years ago.

Story B

As a ship's boy, John Paul had all sorts of odd jobs on board. Sometimes he scrubbed decks or ______ the cook. He cleaned the captain's ______ and ran errands, but he had ______ duties that pleased him more. He ______ to clean the guns, which the merchant ______ carried for protection. And several ______ he stood behind the big wheel to ______ the ship.

Captain Benson wrote in the ______ log, or daily record, that the ______ was calm and smooth-sailing. Nothing ______ happened, but every day was a ______ adventure for the new ship's boy. ______ the end of the voyage it ______ a thrill to sight land. When the ______ docked near Fredericksburg, Virginia, John Paul was ______ to go on shore.

John ______ brother had a tailor shop in ______ and was very happy in his ______ home. He was eager to talk ______ the wonderful country, but John Paul ______ loved America. During the next ______ John Paul visited America often. He

______ used to the free and democratic ______ of the new country. Meanwhile he had ______ to be an expert sailor. Although he was not tall, he was strong and quick. With is long arms he could haul or trim a sail with the best of men.

Source:

Spache, G. (1981) Diagnostic Reading Scales

CTB/McGraw Hill , Cal.

Gr. Level 4.5, p. 32-33

# Words = 215

Story C

When the early settlers came to America, trade was carried on by barter or by using such things as tobacco, sugar, and furs as money. The settlers used Indian wampum sometimes. ______ was shells that were made into ______ and was used by the ______ as decoration and as money. Of ______, when more people came from Europe to ______ in America, they found they would ______ money to pay workers. A mason ______ not always want to take furs ______ his pay. A furrier did not ______ want his wages in grain or ______. People had to have coins, so ______ used whatever was available--English ______, Swedish and Dutch money, and Spanish ______, or "pieces of eight." The ______ soon found there were not ______ of these to go around.

England ______ not let the Colonists make any ______ of their own. But in 1652 Massachusetts ______ up a mint and made its ______ coins anyway. Among these were the ______ "pine-tree shillings." They were ______ this because the picture of a ______ tree was stamped on them. These pine-tree shillings were made for thirty-four years, but they all had the same date on them. In this way, the Colonists pretended that they were obeying England.

Source:

Space, G. (1981) Diagnostic Reading Scales

CTB/McGraw Hill, Cal.

Gr. Level 5.5, p. 32-33

# Words=208

Story D

Just as in driving a car, we use at least three speeds in reading. High gear in reading is called ______, while studying is reading in low ______. Between these two, at second ______, is what might be called a ______ speed of reading. As you may have ______, good readers adapt their rate to the ______ of their reading. The rate they ______ is determined by how much they ______ to get out of the ______ they are reading. Their rate is also ______ by the difficulty of the reading ______. Thus they shift from gear to ______ according to the amount they want to ______ or how difficult they find the ______.

Skimming is useful for a number of ______ in reading. We can use it ______ looking for a particular fact on a ______ or in a table. It is ______ appropriate when we have to ______ a large amount of material that is ______ too interesting or too important. ______ may also be used to ______ the general trends or ideas of a ______ when we do not have to ______ the fine details. It is also helpful when we are making a quick brush-up before recitation. Finally, it is very useful as the speed at which we would do prereading before studying intensively.

Source:

Spache, G. (1981). Diagnostic Reading Scales

CTB/McGraw Hill, Cal., p. 18-19

Grade Level: 6.5

# Words: 218

Story E

The Red River cart was a sturdy, two-wheeled vehicle. It was made entirely of ______. Its parts were held together by ______ pegs and strips of rawhide. The ______ were about two metres across. This wheel ______ helped to prevent tipping. Strips of ______ hide could be wound around the ______ to soften the bumps. A simple ______ sat on the axle between the ______. The cart was usually pulled by an ______. To cross rivers and streams the ______ were removed and attached to the ______ of the box. Then the cart was ______ across the river like a raft. These ______ usually travelled together in groups or ______. There were 500 carts in one train ______.

Old-timers who recall the Red ______ carts remember their horrible, shrieking noise. ______ wheels grinding against wooden axles sounded ______ a thousand fingernails being drawn ______ a chalk-board. The Indians sometimes ______ that the reason the buffalo left the ______ was that they were trying to ______ away from the noise of the ______ River carts!

These carts played an ______ role in opening up the Canadian ______. They could carry heavy loads, up to 450 kg. Many of the early cart trails became today's roads and highways of the Prairies.

Source:

Cruxton, Wilsuh (1978). Flashback Canada. Oxford Univ. Press, Toronto. p. 152-154

Grade Level: 8

# Words=200

Story E1

In Yellowstone National Park there is a strange forest. Bare tree trunks stand upright in the ______ places they grew millions of years ago. ______ are well-preserved fossils of leaves, cones, ______, and seeds of more than 100 kinds of ______ and shrubs. It is called the "______ ______." The wood of the trees looks like ______ wood, but it is as hard as stone. ______ can be cut and polished like ______, but the wood grain can still be ______.

There are forests like the one in _______ Park in several other parts of the world. A ______ erupted, showering out lava, rock, ashes, and ______ debris. Winds and earthquakes accompanying the ______ knocked off branches and foliage. Many ______ were pushed over and carried by the ______ flow, or by mud and water ______ out of lakes and rivers by the volcanic ______. The fallen tree trunks became embedded in the ______; those remaining upright were buried by the volcanic ______. Water containing dissolved minerals from the ______ flowed over and around the tree ______. Heat in the water or from ______ volcanic action caused the minerals from the ______ that had seeped into the tree to ______. The tree was then petrified. Centuries of ______ and water activity wore away the ______ debris between the trees, and once again the ______ came into view.

Source:

King, E. M. (Ed.) (1981). Canadian Test of Basic Skills: Level 13, Form 6, Nelson Canada Ltd.

Grade Level: 8

# Words=227

Story F

Heat losses mean dollar losses. The purpose of a heating ______ is to transfer heat from a ______ chamber to various parts of a ______ as desired. There is no intention of "______ the great outdoors." Yet in all ______ this is precisely what happens ______ in greater fuel consumption and increased ______. Government estimates attribute heat losses to the ______ causes: 50 percent through walls and ______, 25 percent through doors and ______; and 25 percent through infiltration of ______ air around doors, windows, and other ______.

Ways of retarding loss of ______ are suggested by the heat losses ______. Weather stripping and storm sashes reduce ______ losses at doors and windows. The ______ of storm sashes is a ______ of the dead-air space ______ the storm windows and the house ______. Insulating materials reduce heat lost through ______ and roof. These materials owe their ______ heat conductivity to the large ______of dead-air space within them. ______ filling the space inside walls and ______ with insulating material reduces convection currents, ______ of the prime causes of heat ______.

Other products reduce loss of ______ by radiation. One type consists of gypsum ______ or insulation batts covered on one ______ with thin aluminum foil. The bright ______ surface of the foil reflects heat, ______ winter heat in and summer heat ______. The same insulators that keep heat in during the winter also keep heat out during the summer. Thus, air conditioning is not very practical in an uninsulated building.

Story G

The land we now know as Canada was, of course, very different thousands of years ago. Everyone is aware that there _______ no cities, large buildings and landscaped ______. But there were even more significant ______ differences which we probably never even ______. For example, scientists have ______ us that for millions of ______ a thick blanket of ice ______ much of Europe, Asia and North ______, so that during the Ice Age, ______ of these continents was uninhabitable. As the ______ slowly melted, people were able to ______ from Asia into North America, as the ______ of the Canadian and Inuit did.

______ of the animals which are hunted ______ lived in this new land, but ______ were also species which are extinct ______. Long-horned bison, mammoths and mastodons _______ plentiful, as were caribou, beaver, bear and moose.

______ the ice melted, the geography ______ the land was probably similar to ______ we see today. Forests, plains, ______ and mountains all helped to ______ the kind of lifestyle the inhabitant ______ lead. The culture of each Indian ______ was influenced by the geographical ______ of the part of the ______ in which the tribe settled. ______ the Iroquois, for example, who settled ______ the Great Lakes as far east ______ the Hudson River became farmers. The Algonquins settled in heavily wooded or barren areas and became hunters and fishermen.

Source:

Kirbyson (1977). In search of Canada, Prentice-Hall, pg. 31.

Grade Level: 9.6

# Words: 200

Story H

Starving people often show no symptoms of vitamin deficiencies, for several reasons. First of all, above a certain very ______ minimum, the need for vitamins is ______ proportional to the total amount of ______ taken in. Vitamins form parts of ______ that are important in any ______ absorption. If little food is ______ in, the body can get along with ______ enzyme molecules, and hence with less vitamins. ______ acid, for instance, is an important ______ of the enzyme system of carbohydrate respiration. The ______ for ascorbic acid is thus proportional to the ______ intake. The need for the B-complex ______ increases markedly with increasing physical ______. A starved man, being practically ______, has a minimum need for these vitamins.

______ is another reason why semi-starved populations ______ suffer vitamin-deficiencies. Intentionally or not, they ______ more wisely than most well-fed, civilized ______. The tendency of a hungry ______ to eat everything that comes his ______ is good, in the main. Well-fed people ______ to eat many wholesome food because of ______ or psychological prejudices; for the ______ reason they eat many foods of ______ nutritional value. Under the spur of ______, psychological and cultural prejudices are soon sloughed off.

Source:

Harden, Bajema (1978). Biology: Its Principles and Implications. W. H. Freeman & Company, San Francisco, 3rd ed. pg. 492

Grade Level: 11.3

# Words=200

Key
Cloze Task
Correct Words

Story A	Story B	Story C	Story D	Story E
1. shovels	1. helped	1. wampum	1. skimming	1. wood
2. Rome	2. cabin	2. beads	2. gear	2. wooden
3. city	3. other	3. Indians	3. gear	3. wheels
4. volcano	4. helped	4. course	4. moderate	4. height
5. thousand	5. ship	5. settle	5. heard	5. buffalo
6. people	6. times	6. need	6. purpose	6. wheels
7. markets	7. steer	7. did	7. use	7. box
8. volcano	8. ship's	8. for	8. want	8. wheels
9. miles	9. trip	9. always	9. material	9. ox
10. time	10. unusual	10. tools	10. influenced	10. wheels
11. Lava	11. real	11. they	11. material	11. bottom
12. lava	12. At	12. shillings	12. gear	12. floated
13. long	13. was	13. dollars	13. retain	13. carts
14. found	14. ship	14. colonists	14. going	14. trains
15. away	15. waiting	15. enough	15. situations	15. sometimes
	16. Paul's	16. would	16. when	16. River
	17. Fredricksburg	17. money	17. page	17. Ungreased
	18. new	18. set	18. also	18. Like
	19. about	19. own	19. cover	19. across
	20. already	20. famous	20. not	20. joked
	21. years	21. called	21. skimming	21. plains

22. became
23. ways
24. learned

22. pine

22. determine
23. selection
24. know

22. get
23. Red
24. important
25. West

Story F

1. system
2. combustion
3. building
4. heating
5. cases
6 resulting
7 cost
8. following
9. roof
10. windows
11. cold
12. sources
13. heat
14. themselves
15. heat
16. effectiveness
17. result
18. between
19. windows
20. walls
21. Low
22. amount
23. Furthermore
24. Floors
25. one
26. Losses
27. heat
28. board
29. face
30. metallic
31. keeping
32. out

Error Detection

Administration Directions

Students are given 2 levels of stories (story at reading level and one at frustration reading level). The lower level story is given first.

"Underline any parts of the story that don't seem to make sense to you. Tell me when you're finished." Give no more prompts. Once first story is completed, second story is handed out. Give 10 minutes to complete both stories. (correct underlining has been done here for the stories).

Levels

Grade 4	(LD)	stories 1, 2	Grade 7	(LD)	stories 4, 5
	(N)	stories 2, 3		(N)	stories 5, 6
	(G)	stories 3, 4		(G)	stories 6, 7
Grade 5	(LD)	stories 2, 3	Grade 8	(LD)	stories 5, 6
	(N)	stories 3, 4		(N)	stories 6, 7
	(G)	stories 4, 5		(G)	stories 7, 8
Grade 6	(LD)	stories 3, 4	Grade 9	(LD)	stories 6, 7
	(N)	stories 4, 5		(N)	stories 7, 8
	(G)	stories 5, 6		(G)	stories 8, 9

Story 1

Some people spend much of their time under water. They are called divers. If anything goes wrong with a train below the water-line, divers put on their suits and go down with their tools to repair the damage. They wear a special kind of suit made of the water and rubber which keeps out canvas. It covers the body from feet to neck but leaves the hands free. Sleeves end in water-tight cuffs at the toes. A heavy helmet connected with a tube brings water from above the surface of the air. The helmet has windows and fastens to the neck of the boat. In order that the diver may sink, the suit is "padded" back and front with plates of lead and the metal are weighted with shoes. The clothes weigh about 150 pounds. Would you like to be a diver and perhaps go down to the bottom of the ocean to save the lives of those in a damaged submarine?

Story 2

Suppose that you have some beautiful poppies growing in your garden. Suppose too that you want to get some seed from them so that you can have more animals just like them next year. You must be sure, then, not to pick all the poppy flowers. If you do not leave flowers some of the plants on the, you will not have any seeds. The flowers are the part of the plant that produce the seeds. There will be many seeds if all the flowers are picked.

The seeds of trees and bushes of the pine family are cones formed in. But most other sees come from flowers. More than 190,000 kinds of plants produce seeds, and all but 700 produce their seeds in the roots.

Not all flowers are large and bright-colored like poppies. Many flowers you have seen that you did not probably know flowers were. Cottonwood and willow trees have flowers, but their flowers are small and are not brightly colored.

Source:

Spache (1981). Diagnostic Reading Scales. CTB/McGraw Hill, Cal., p. 30-31.

Grade Level: 4.5

# Words=199

Story 3

Elephants are found wild today only in cold regions--in tropical Africa and in India. The story was very different 50 thousand years ago. Then, two species of the elephant family roamed North America and Europe in vast numbers.

One of them was the mastodon. The mastodon during the part of eastern in our country lived the period of the Great Ice Age. In the swamps that were formed when the ice disappeared, many of the huge creatures were trapped and killed. We have found some of their skeletons. At a glance the mastodon like the looked have must elephants of today, except that it was covered with coarse, woolly hair and its tusks were much larger. It was probably heavier than the elephants we know, but not taller. Its head was flatter and its lower jaw longer. Its feet were not like the teeth of the elephant today.

More than 200 years ago, the people of New England dug when they mastodon of the bones found ditches to drain swamps. At first they thought that the water they found were bones of giant people. When they found teeth that weighed more than four pounds apiece, they decided that the giants were giants indeed.

Source:

Spache (1981). Diagnostic Reading Scales. CTB/McGraw Hill, Cal., pg. 16-17

Grade Level: 5.5

# Words=206

Story 4

One of the most beautiful and lasting kinds of building stone is marble. Marble may be pure white or colored, or it may have stones in it. It can be polished a surface so it that smooth very has. All marble was once limestone. Limestone, deep under the ground, may be changed to marble by heat and pressure.

Granite is another poor building stone. It is formed from rock so hot that it is liquid. You may have seen pictures of liquid rock or lava, pouring out of vulcanoes. Lava cools and becomes rock rather quickly. But granite is held hot underground the made from liquid. This rock cools very slowly. The liquid rock from which granite comes cools so slowly that the different materials in it separate from one another and form crystals. Granite is always a speckled rock because the different crystals in it are the same color. Two minerals are always found in granite. They are quartz and feldspar. The dark speckles in mineral usually some are granite other. Granite makes very good building material because it is so hard. It can be beautifully polished, and the weather does not harm it.

Source:

Spache (1981). Diagnostic Reading Scales. CTB/McGraw Hill, Cal., pg. 34-39.

Grade Level: 6.5

# Words: 196

Story 5

One very important reason for slow reading is lack of pre-planning. Many fast readers have not learned to adapt their rate to the difficulty of the material they are reading. They can see objects quickly with their eyes, as in looking through the window of a moving car, but when they read, the present movements not quick are same. They stop to look at each individual word as though that were not necessary for gaining ideas. They tend to read their textbooks, magazines, and even the newspaper at about the same rate of speed.

It has been shown by many studies of good writers that the rate in fiction materials should be two to three times as fast as that in nonfiction. Slow readers tend to "study" everything they read, while good readers vary their rate consciously according to get to the facts they kinds of want. For example, if you are a student trying to find only one fact on a page, you certainly do not need to read the entire page. You can skim quickly over the fact until you find are you seeking the page. If, on the other hand, you are expected to report critically on a piece of prose, you will need to read much more slowly and analytically.

Source:

Spache (1981). Diagnostic Reading Scales. CTB/McGraw Hill, Cal., p. 36-37.

Grade Level: 7.5

# Words=213

Story 6

One thing that language has done is to let man tell stories. Man has always told stories about how brave he was and how big a bear he killed. He has always told how big the fish was that he talked to last year. He tells all sorts of stories. Some of them are true. Some of them are false. Most of them are partly true and partly false.

For thousands and thousands of years, men and women have told stories to amuse each other and to amuse their children. When they didn't know the real answer they up a good story to question a made. After the story had been repeated many times, people believed it. It became part of their culture. These stories we call myths.

When men and women don't want to answer questions or don't make up the stories often, they know the answers. We want satisfying answers, answers that seem to be nonsense. So we make them up.

Men made up spirits to explain why the wind blows. To explain giants, they said the earth that were shaking the earthquakes. They invented stories to justify liking and hating some and others people. All over the world men have made up marvelous stories to justify things they did and explain things they did not understand.

People in all times and places have wondered about how man began. Most of them have myths to explain this puzzling question.

Story 7

Such liberation as women have enjoyed up to this time is usually explained by two factors. These are the spread of education, and the dedicated fighting spirit of men themselves, especially those significant early suffragettes who, in order to achieve passage of laws ensuring equal rights, chained themselves to railings, threw themselves under the hooves of race horses, or starved themselves in prison to the point of death. These heroic women certainly helped their cause, but only because toward the tide turned the already had of gaining their feminist goals.

What is still hard for people to see is that the technological and scientific revolution in which mankind has been involved has with speed during ever-increasing century this past greatly affected every social and personal relationship, no matter how seemingly private. It is a process whose beginning is nowhere in sight. Scientifically-based industry has brought wealth and freedom--even to the poor and the disadvantaged.

This wealth, springs the source and from freedom two creates it from the rise in the value of labor and the growth of the consumer society. Go to the most wretched slum in urban America or to a desolate village in Appalachia and there you will find canned goods of every height, wrapped and sliced bread, packaged meats, and vegetables, not to mention refrigerators, vacuum cleaners, running water, and heat. Move from the ghettos to middle-class suburbs and the ease of household management becomes even more marked--with washing machines, dishwashers, and electrical gadgets for quick preparation of food.

Source:

Adapted from Plumb "Up From Slavery" Horizon, Summer 1971, pg. 80-81. In Teaching American History: The Quest for Relevance, Alian Kownslared, 44th Yearbook, 1974 National Council for Social Studies.

Story 8

There are many reasons why Canadians might have positive feelings about the United States. In part, we owe our security, and our high standard of living to the U.S. Some of us have friends or relatives in that country. Many of us have travelled there. We share a common language. Many of our political and religious beliefs are different. Most Americans are friendly, generous hosts and polite visitors. It seems that have we sense even of a common humor-we laugh at the same jokes. This seems a minor point, but perhaps it is quite significant.

Unfortunately, Canadians also have reasons for some negative feelings about the United States. In the past, the U.S. has been an island. Americans have invaded us twice. They have seemed ready to do so on several other occasions. A good portion of Canadian history has involved our reacting to the American presence. Perhaps this is still true yesterday. Presently, Americans own huge chunks of our country and its economy. Their culture threatens to overpower us. American television, films, and play music a large magazine in part our lives. Many Canadians feel that Americans do not know enough about us. We would like more respect from them. Indeed, it seems that often they take us for granted. The United States is not an enemy country. Yet, it still threatens our independence in many ways.

For many reasons, there has been a recent growth of anti-Americanism in Canada. There also is evidence that some Americans are becoming more critical of us. Today, still quite are relations basically good. However, if certain trends continue, trouble might lie ahead. It is very important for Canadians (and Americans) to know about the present state of relations. They also should know the reasons for this situation.

Source:

Allans, Evans, Morfinello (1978). Canada's Century, McGraw Hill, Ryerson.

Grade Level: 9.6

# Words: 235

Story 9

Since the time of the Greeks certain individuals have impressed their fellow men with the most amazing feats of memory. These individuals have been able to remember only a very few ideas including dates, names, numbers, and faces. They have been able to perform special memory feats such as memorizing whole areas of knowledge perfectly, or remembering decks of cards in the order anyone chose to present them.

In most cases these individuals were banning special memorizing techniques known as mnemonics. These tools enabled them to remember large volumes of material that otherwise would have been impossible. Traditionally these techniques have been scorned as mere tricks; appreciated as logical and necessary. Recently the attitude towards memory strategies has changed. It has been realized that the methods which enable minds to remember something more easily, quickly, and for longer time periods, must be more than simple tricks.

Current knowledge about the ways in which our minds work show that these poor techniques are indeed closely connected to the basic ways in which the brain functions. The use of memory techniques has consequently gained respectability and popularity, and they are currently being taught in universities and schools as additional aids in the learning process. The improvement of memory performances that can be achieved is not noteworthy, and the range of techniques is wide.

Memory is primarily an associative and linking process. Mnemonic techniques are simply the association and linking of images to key words and key concepts that is only effective for ordering events.

Source:

Buzon (1983). Use Both Sides of your Brain. Rev. Ed., pg. 63

Grade Level: 11.1

# Words: 226

Math Problem Solving

Administration Directions:

Students in Phase I and II received 2 math questions for their grade level (elementary - math problem: grade 4; junior high - math problem grade 7).

Read the directions with your student.

"Please read each problem carefully, solve them and write your answers. On the space given, please show all the procedures and methods that you tried to solve the problems. Tell me when you're done."

Once the student has finished the problem, use your prompt sheet to establish the level.

Don't forget to check off the strategies on the observational checklist.

Allow 5-10 minutes for the student to complete the problem.

Math Problem Solving: Grade 4

Name ____

School ______________________________Date____________

Please read each problem carefully, solve them and write your answers. On the blank space given, please show all the procedures and methods that you tried to solve the problems.

Problem 1

You have a stick 40 m long. You want to cut it into 40 equal pieces. It takes you one minute to cut once. How long would it take for you to cut 40 pieces?

Problem 2

Joanie has two sticks. When she joins the two sticks together to make a long stick, she gets a stick 30 cm long. One of the sticks is 6 cm longer than the other. How long is the longer stick? How long is the shorter stick?

Math Problem Solving: Grade 7

Name ____

School ______________________________Date __________

Please read each problem carefully, solve them and write your answers. One the space given, please show all the procedures and methods that you tried to solve the problems.

Problem 1

A cycling race was open to bicycle as well as to tricycle riders. During the race, Jim counted 7 riders and 19 wheels travelling past his house. How many bicycles and how may tricycles passed his house?

Problem 2

Tony's restaurant has 30 small square tables to be used for a meeting. Each table can seat only one person on each side. If the tables are pushed together to make one long table, how many people can sit at the table?

Math Problem Solving - Scoring Sheet

Student's Name ______________________________

School ______________________Gr. ________ Date______________

The scoring system adopted for the math problem tasks is based on levels of prompting. The highest level of performance is correct spontaneous solution (without prompting). However, even for the student who passes at this level, a number of probes are asked to establish procedures/methods used to solve the problem. As the student responds to the probes the tester should check off appropriate strategies on the observational checklist. The lowest level of performance is failure even after the maximum number of prompts given for a specific task.

For each task please check off the level at which the student passed the task.

Problem 1 Comments

[ ] Level 1

[ ] Level 2

[ ] Level 3

[ ] Level 4

[ ] Level 5

[ ] Level 6

Problem 2

[ ] Level 1

[ ] Level 2

[ ] Level 3

[ ] Level 4

[ ] Level 5

[ ] Level 6

[ ] Level 7

Math Problem Solving Strategy Checklist

Student's Name _______________ I.D. _____________ Grade ________

1. Restating problem in own words
   - ☐ Problem 1
   - ☐ Problem 2
2. Re-reading (segments of) problem
   - ☐ Problem 1
   - ☐ Problem 2
3. Considering alternative interpretation of problem
   - ☐ Problem 1
   - ☐ Problem 2
4. Stating plans or solution procedure
   - ☐ Problem 1
   - ☐ Problem 2
5. Using symbols (e.g., x, y, a)
   - ☐ Problem 1
   - ☐ Problem 2
6. Writing down equations (e.g., 150 + x = 755)
   - ☐ Problem 1
   - ☐ Problem 2
7. Using manipulatives (e.g., $\begin{array}{r}135\\ +\underline{30}\\ 165\end{array}$)
   - ☐ Problem 1
   - ☐ Problem 2
8. Guessing and checking
   - ☐ Problem 1
   - ☐ Problem 2
9. Looking for alternative ways of solving the problem
   - ☐ Problem 1
   - ☐ Problem 2

10. Generalizing solutions

☐ Problem 1
☐ Problem 2

11. Determining the reasonableness of the answer

☐ Problem 1
☐ Problem 2

12. Other ____

☐ Problem 1
☐ Problem 2

13. Other ____

☐ Problem 1
☐ Problem 2

MATH PROBLEMS PROMPTING SHEET

Grade 4

Problem 1

B. Questions

1. Level 1: HOW DID YOU GET THIS ANSWER?:
    a. How did you get this answer?
        1) ___ Multiply the number of cuttings by time needed for each cutting
        2) ___ Subtract 1 from 40 and multiply it by 1 minute
        3) ___
    b. What did you look for first to solve it?
        1) ___ Number of cutting
        2) ___ Number of pieces
        3) ___ Time required for each cutting
        4) ___
    c. (REM: Ask when student does not show a definite plan in question a and b) What did you do next?
        1) ___
    d. Did you check your answer to see if it's correct?
       How did you check? (REM: If answer is yes)
       How can you check? (REM: If answer is no)
        1) ___
2. Level 2: CAN YOU THINK OF ANY EASIER WAYS?:
    a. What should you find out first?
        1) ___ number of cuttings
        2) ___ number of pieces
        3) ___ time needed to cut once
    b. How many times do you have to cut to get 40 pieces?
        1) ___ 39 times
        2) ___
    c. Can you think of any easy ways to solve the problem?
        1) ___ draw a picture
        2) ___ count how many times that I have to cut :go to level 3
        3) ___: go to level 3

3. Level 3: HOW ABOUT DRAWING A PICTURE?
   - a. Can you solve it by drawing a picture of a stick?
   - b. How many times do you have to cut?
     - 1) ___ Child draws a picture, counts and gives the answer
     - 2) ___ Child draws a picture, counts but gives a wrong answer (REM: When drawing and segmenting is correct, prompt to count again. If not successful, then go to Level 4)
     - 3) ___ Child draws a picture but does not count :(REM: When drawing and segmenting is correct, prompt to count again. If not successful, then go to Level 5)
     - 4) ___ Child does not draw a picture properly :go to Level 4 and start from there
4. Level 4: DRAW A STICK 3m LONG
   - a. Let's draw a stick 3 m long and see how many times you have to cut to get 3 pieces.
     - 1) ___ 2 times
     - 2) ___ 3 times : go to Level 5
   - b. Can you solve the problem now?
     - 1) ___ 39 minutes
     - 2) ___ : go to Level 6
5. Level 5: CAN YOU COUNT HOW MANY TIMES YOU HAVE TO CUT?
   - a. Now, let's look at your drawing. Can you count how many times you actually had to cut to get three pieces?
     - 1) ___ 2 times
     - 2) ___
   - b. Look carefully again and count the number of cuttings. Can you tell me how many times you actually have to cut?
   - c. Can you solve the problem now?
     - 1) ___ 39 times
     - 2) ___ :go to Level 6
6. Level 6: DRAW SOME MORE PICTURES. WHAT IS COMMON?
   - a. Let's draw some more pictures. How about of a stick 4 m long?
   - b. Can you count how many times you had to cut to get 4 pieces?

c. When you want to get 4 pieces, you cut 3 times.
When you want to get 3 pieces, you cut 2 times.
What's common here? What did you do to find out how many times you had to cut?

d. Can you solve the problem now?

Problem 2

D. Question

1. Level 1: HOW DID YOU GET THIS ANSWER?:
    a. How did you get this answer?
        1) ___ get two numbers and see whether it gives 30 by adding and 6 by subtracting each other
        2) ___
    b. What did you do, first, to find out the answer?
        1) ___ draw a picture
        2) ___ make a table
        3) ___ get all kinds of combination of two numbers
        4) ___
    c. (REM: Ask when student does not show a definite plan in question a and b)
    What did you do next?
        1) ___
    d. Did you check your answer to see if it's correct?
    How did you check? (REM: If answer is yes)
    How can you check? (REM: If answer is no)
        1) ___ I added and subtracted and see if it gives 30 and 6.
        2) ___ I may add and subtract two numbers and see whether it gives 30 and 6.
        3) ___
2. Level 2: CAN YOU THINK OF ANY EASIER WAYS?:
    a. Can you find any easy ways to find how long each stick is?
        1) ___ draw a picture
        2) ___ draw a diagram
        3) ___ make a table
        4) ___ count from 15
        5) ___
    b. Can you think of two numbers which add up to 30 but have a difference of 6?

1) ___ 18 and 12
2) ___
: go to Level 3

3. Level 3: HOW ABOUT DRAWING A PICTURE?

a. What do you have to find out here? (What is the question specifically asking?)
1) ___ length of a stick
2) ___ length of two sticks
3) ___ two numbers
4) ___: go to the original problem and then to 3.b

b. Can you solve it by drawing a picture?
1) ___ draws a picture and gets the answer
(REM: If student does not check answer spontaneously, ask "How do you know if your answer is correct?" Comment on scoring sheet).
2) ___ draws a picture but gets wrong answer and does not check
: go to Level 4
3) ___ draws a picture but does not know how to use the picture
: go to Level 5
4) ___ does not draw a picture properly
: go to Level 5 and start from there

4. Level 4: CHECK YOUR ANSWER

a. Let's check whether your answer is right or wrong. The total length of two sticks was 30 cm and the difference was 6 cm. What is your answer? Do they add up to 30? Is the difference between them 6?
1) ___ Oh, no. It should be 18 and 12
2) ___ My answer is right
: go to Level 5

5. Level 5: THINK ABOUT TWO STICKS

a. Let's think about two sticks which would make one stick 30 cm long. How about drawing two sticks each 15 cm long?
If you take 1 cm from one stick and put it on the other, what is the length of each one?
1) ___ 16 and 14
2) ___
How much longer is one stick than the other?

3) ___ 2
4) ___

b. If you take one more centimeter again, what are the lengths of each stick?

1) ___ 17 and 13
2) ___

Then, what is the difference between the two sticks?

3) ___ 4
4) ___

c. If you continue to subtract one centimeter from one stick and add to the other stick, how many times do you have to repeat to get 6 cm difference?

1) ___ three times
2) ___

: repeat #a) #b) and #c)

d. You may realize that you have to repeat 3 times. Then, what is the length of a shorter one? What is the length of a longer one?

1) ___ 18 and 12
2) ___

II. Grade 7

A. Problem 1

B. Questions

6. Level 1: HOW DID YOU GET THIS ANSWER?:

a. How did you get the answer?

1) ___ get the two numbers which add up to 7 and multiply each number by 2 and 3 and total the products
2) ___ draw a picture
3) ___ make a table of numbers
4) ___ divide 19 by 7
5) ___

b. What did you look for, first, to solve it?

1) ___ number of riders
2) ___ number of tricycle
3) ___ number of bicycle
4) ___ total number of wheels
5) ___

c. (REM: Ask when student does not show a definite plan in question a and b) What did you do next?

1) ___

d. Did you check your answer to see if it's correct?
How did you check? (REM: If answer is yes)
How can you check? (REM: If answer is no)

7. Level 2: CAN YOU THINK OF ANY EASIER WAYS?:

a. Can you think of any easier ways to solve this problem?
1) ___ draw a picture
2) ___ make a table
3) ___ get two numbers and figure out whether they can give me 7 and 19 by multiplying and adding
4) ___ understand the problem
5) ___ find out the key word
6) ___

b. What should look for, first, to solve this problem?
1) ___ number of tricycle riders
2) ___ number of bicycle riders
3) ___ total number of riders
4) ___ total number of wheels
5) ___
6) If there are 4 wheels and all of them belong to bicycles, how many bicycles are there?
a) ___ 2
b) ___
7) If there are 9 wheels and all of them belong to tricycles, how many tricycles are there?
a) ___ 3
b) ___
8) What are the total number of riders and cycle wheels in this case?
a) ___ 5 and 13
b) ___

c. What did you do to find out the number of bicycles and tricycles?
1) ___ multiply the number of riders and number of wheels and add the products together
2) ___

d. If you know how to find the number of bicycles and tricycles using the total number of wheels, can you solve the problem now?

1) ___ 5 tricycles and 2 bicycles
2) ___
: go to Level 3

8. Level 3: HOW ABOUT DRAWING A PICTURE?

a. How about drawing a picture? It may help you to figure out how many bicycles and how many tricycles there are.

b. How many bicycle riders and how many tricycle riders are there?
1) ___ draw a picture and get the answer (REM: If no spontaneous checking is shown, ask "How do you know if your answer is right?").
2) ___ draws a picture but gets a wrong answer and does not check
: go to Level 4
3) ___ draws a picture but does not know how to use it
: go to Level 5
4) ___ does not draw a picture properly
: go to Level 6

9. Level 4: LET'S CHECK YOUR ANSWER

a. Let's check your answer. Do you remember how many riders there were?
1) ___ 7
2) ___ (REM: Ask "Don't you think you have more (or less) riders than the given number?")
3) ___ Oh, Yes.
4) ___
: go to 5.a

b. There are some wheels left over, what should you do with them?
1) ___ I give the left wheels to other riders additionally
2) ___

10. Level 5: WE CAN CIRCLE TWO OR THREE WHEELS

a. Let's find out how many bicycle riders and how many tricycle riders there are. O.K. You know how many wheels one bicycle has and you also know how many wheels one tricycle has. Right? Then, we can circle two or three wheels to find out how many bicycles and how many tricycles are there.

b. Can you count how many riders are there?
1) ___ 5 tricycles and 2 bicycles
2) ___

c. (REMARK: Examiner can ask the questions #a) and b) written above for level 4 students.

11. Level 6: LET ME DRAW A PICTURE FOR YOU

a. Let's draw a picture of 7 riders and 19 wheels (REMARK: Examiner draws 7 riders and 19 wheels in such a way that it is easy to classify them into bicycle and tricycle wheels and riders)

b. (REMARK: Ask the questions for the level 5)

Problem 2

D. Questions

1. Level 1: HOW DID YOU GET THIS ANSWER?:

a. How did you get this answer?

1) ___ figure out how many people can sit at each table and how many people can sit at the end

2) ___ multiply 30 by 2 and add 2

3) ___

b. What did you look for, first, to solve the problem?

1) ___ number of people at each table

2) ___

c. What did you do in trying to solve the problem?

1) ___ draw a picture

2) ___ make a table

3) ___ count in my mind

4) ___

d. (REM: Ask when student does not show a definite plan in question a and b) What did you do next?

1) ___

e. Did you check your answer to see if it's correct?

How did you check? (REM: If answer is yes)

How can you check? (REM: If answer is no)

1) ___ draw a picture

2) ___ read the problem again

3) ___ check the number of people who can sit at the end

4) ___

2. Level 2: CAN YOU THINK OF ANY EASIER WAYS?:

a. Can you think of any easier ways to find out the number of people?

1) ___ draw a picture and count

2) ___ think about how many can sit at the long side and how many can sit at the end

3) ---

b. How can you find out how many people can sit at the long sides and how many people can sit at the ends of one long table?

1) ___ There are 30 desks. Thus, 30 people can sit at each of two long sides. This gives 60 seats. Add two more seats at end end. The total is 62.

2) ___ 30 x 2 and 2, that's 62

3) ---

: go to Level 3

3. Level 3: HOW ABOUT DRAWING A PICTURE?

a. Can you solve it by drawing a picture?

b. (REM: after drawing) How many people can sit there?

1) ___ draws a picture and gets the answer

2) ___ draws a picture but gets a wrong answer

:(REM: If the picture is correct, ask to check the answer and go to Level 4)

3) ___ draws a picture but does not get the pattern

: go to Level 5

4) ___ draws a picture improperly

: go to Level 4 and start from there

4. Level 4: DRAW A PICTURE OF 3 TABLES

a. How about drawing a picture of 3 tables?

b. How many people can sit there?

1) ___ 8

2) ---

c. How many people can sit at the long side?

1) ___ 3

2) ___ 6

3) ---

d. How many long sides does this long table have?

1) ___ 2

2) ---

e. How many people can sit at the end?

1) ___ 2

2) ___

f. Can you solve the problem now?

5. Level 5: DRAW ANOTHER PICTURE. WHAT IS COMMON?

a. Let's draw ANOTHER picture. If there are 4 tables put together, how many people?

1) ___ 10

2) ___

How many people at the TWO long sides?

3) ___ 8

4) ___ 16

5) ___

How many people at the end?

6) ___ 2

7) ___

b. When 3 tables are put together, how many people?

1) ___ 8

2) ___

c. When 4 tables are put together, how many people?

1) ___ 10

2) ___

d. What's common here? What did you do to find out how many people can sit there?

1) ___ Get the number of people at the long side and multiply it by two and add two

2) ___ Just count how many people can sit there

3) ___

e. Can you solve the problem now?

6. Level 6: IS THE NUMBER OF PEOPLE AT THE LONG SIDE THE SAME NUMBER AS THE NUMBER OF TABLES?

a. How many people can sit at the long side when 3 tables are put together?

1) ___ 8

2) ___

b. How many people can sit at one long side when 4 tables are put together?

1) ___ 10

2) ___

c. Is the number of people who sit at the long side the same as the number of tables?

1) ___ yes

2) ___

d. How many people can sit at the ends when there are 3 tables?

1) ___ 2

2) ___

e. How many people can sit at the ends when there are 4 tables?

1) ___ 2

2) ___

f. Can you solve the problem now?

1) ___ 62

2) ___

7. Level 7: READ THE PROBLEM AGAIN

a. Let's read the problem again. When the tables are put together, can anybody sit at the sides where tables are joined together?

b. Examiner asks questions #a, b), c), d) and e) written above for Level 6 students.

APPENDIX E

Means and Standard Deviations

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MEANS AND STANDARD DEVIATIONS

		PRE			POST YEAR 2			MAINTENANCE	
GRADE 4 LD	**IE**	**SPELT**	**CONTROL**	**IE**	**SPELT**	**CONTROL**	**IE**	**SPELT**	**CONTROL**
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	94.97	99.13	88.77				93.28	93.48	90.29
STANDARD SCORES	* (9.68)	(7.18)	(12.35)				(12.28)	(11.78)	(6.82)
NONVERBAL	103.69	103.26	93.88				101.44	97.77	97.24
STANDARD SCORES	(11.45)	(9.72)	(12.66)				(13.35)	(9.25)	(10.97)
QUANTITATIVE	101.54	97.87	92.65				95.03	94.32	91.35
STANDARD SCORES	(11.04)	(9.97)	(12.57)				(11.91)	(10.16)	(10.06)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	3.27	3.23	3.09	4.89	4.76	4.51	4.70	5.37	4.82
GRADE EQUIVALENT	(0.84)	(0.76)	(0.86)	(1.85)	(1.35)	(1.37)	(1.81)	(1.88)	(1.79)
READING COMPREHENSION	2.48	2.59	2.53	4.69	5.14	3.64	4.20	4.12	5.02
GRADE EQUIVALENT	(0.44)	(0.34)	(0.50)	(2.42)	(1.96)	(1.16)	(1.77)	(2.67)	(1.17)
MATH COMPUTATION	3.98	3.80	3.89	5.41	5.28	4.92	5.31	5.87	5.48
GRADE EQUIVALENT	(0.82)	(0.67)	(0.88)	(1.48)	(0.94)	(1.18)	(1.40)	(1.27)	(1.62)
CONCEPT APPLICATION	4.08	4.01	3.59	5.69	4.74	4.78	5.78	6.14	4.76
GRADE EQUIVALENT	(1.21)	(1.21)	(0.61)	(1.94)	(1.95)	(4.76)	(2.07)	(2.07)	(1.81)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 LD	PRE IE	 SPELT	 CONTROL	POST YEAR 2 IE	 SPELT	 CONTROL	MAINTENANCE IE	 SPELT	 CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	2.28 * (0.65)	2.49 (0.63)	2.64 (0.58)	2.42 (0.47)	2.65 (0.58)	2.62 (0.53)	2.64 (0.58)	2.63 (0.53)	2.53 (0.33)
SOCIAL	2.69 (0.50)	2.61 (0.57)	3.07 (0.61)	2.58 (0.59)	2.91 (0.49)	2.91 (0.57)	3.07 (0.61)	2.91 (0.57)	3.08 (0.37)
PHYSICAL	2.82 (0.50)	2.94 (0.78)	2.96 (0.62)	2.74 (0.56)	2.89 (0.63)	2.89 (0.55)	2.96 (0.62)	2.88 (0.55)	2.86 (0.78)
GENERAL	2.74 (0.58)	2.57 (0.67)	3.04 (0.48)	2.52 (0.57)	2.87 (0.53)	2.89 (0.47)	3.04 (0.48)	2.88 (0.46)	2.88 (0.48)
SELF CONCEPT: COOPERSMITH									
SCHOOL	4.57 (1.54)	5.54 (1.62)	5.94 (1.75)	4.46 (2.53)	4.84 (2.13)	4.88 (2.00)	4.38 (2.28)	5.69 (2.18)	3.93 (2.19)
GENERAL	16.07 (3.43)	17.23 (3.83)	19.44 (3.72)	15.50 (5.54)	17.08 (4.94)	18.94 (3.23)	16.03 (5.81)	19.23 (4.15)	18.31 (4.51)
LOCUS OF CONTROL									
INTERNAL	22.23 (3.95)	23.26 (3.58)	23.32 (2.49)	24.40 (7.72)	25.15 (3.88)	22.53 (2.00)	23.03 (4.14)	26.01 (5.60)	26.97 (2.19)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 4 LD	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	3.13 (1.36)	2.72 (2.00)	2.93 (1.48)	7.90 (2.60)	8.72 (1.90)	8.87 (1.54)	4.61 (2.32)	6.24 (2.31)	4.33 (2.42)
CORRECT	5.07 (2.55)	4.86 (2.34)	5.27 (1.57)	6.32 (2.31)	6.59 (2.08)	6.00 (1.71)	2.23 (2.95)	5.69 (2.90)	0.66 (0.79)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	2.60 (1.59)	2.07 (1.55)	2.56 (1.83)	3.09 (1.54)	3.38 (1.03)	3.33 (1.16)	2.57 (1.43)	3.28 (1.01)	2.56 (0.83)
STORY 2	0.84 (0.85)	1.28 (1.26)	1.22 (1.03)	2.00 (1.41)	2.86 (1.50)	2.11 (0.37)	1.97 (1.33)	2.48 (1.22)	1.89 (0.73)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 4 LD	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED PROB. SOLVING							99.31	100.41	98.00
							(11.36)	(08.12)	(09.42)
MATH STRATEGIES									
REREADING	0.72	1.31	0.57	1.52	1.39	1.39	1.40	1.54	1.22
	(0.72)	(0.72)	(0.83)	(0.70)	(0.84)	(0.71)	(0.75)	(0.50)	(0.88)
STATING PLANS	0.04	0.77	0.17	0.20	0.23	0.17	0.16	0.62	0.39
	(0.20)	(0.97)	(0.38)	(0.49)	(0.58)	(0.38)	(0.37)	(0.63)	(0.64)
GUESSING & CHECKING	0.92	1.00	0.74	0.16	0.54	0.22	0.36	0.46	0.48
	(0.85)	(0.88)	(0.90)	(0.46)	(0.63)	(0.51)	(0.56)	(0.63)	(0.58)
MANIPULATIVES	0.08	0.31	0.17	0.52	0.23	0.35	0.56	0.92	0.74
	(0.27)	(0.61)	(0.48)	(0.70)	(0.58)	(0.56)	(0.50)	(0.73)	(0.67)
REASONABLENESS OF ANSWER	0.14	0.12	0.26	0.24	0.39	0.26	0.24	0.15	0.22
	(0.20)	(0.19)	(0.44)	(0.51)	(0.63)	(0.44)	(0.51)	(0.36)	(0.51)
ALTERNATIVES	0.24	0.07	0.17	0.20	0.08	0.17	0.44	0.85	0.35
	(0.51)	(0.27)	(0.38)	(0.49)	(0.27)	(0.38)	(0.64)	(0.86)	(0.36)
METACOGNITIVE READING	27.90	29.30	28.35	29.70	31.90	28.20	28.30	31.30	28.75
	(4.61)	(3.68)	(1.23)	(3.23)	(5.36)	(3.84)	(4.43)	(4.26)	(2.86)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 AVERAGE	PRE IE	 SPELT	 CONTROL	POST YEAR 2 IE	 SPELT	 CONTROL	MAINTENANCE IE	 SPELT	 CONTROL
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	106.39	105.62	102.41				99.66	112.45	100.21
STANDARD SCORES	(10.48)	(6.98)	(10.00)				(13.28)	(10.60)	(9.89)
NONVERBAL	102.80	104.08	102.38				100.80	157.26	98.24
STANDARD SCORES	(12.46)	(9.30)	(13.62)				(14.97)	(12.54)	(14.20)
QUANTITATIVE	102.32	105.54	101.56				95.68	128.87	96.32
STANDARD SCORES	(10.89)	(9.92)	(9.41)				(12.28)	(11.35)	(9.81)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	4.64	4.70	4.76	6.51	6.11	6.15	5.22	6.81	6.29
GRADE EQUIVALENT	(0.94)	(0.68)	(0.98)	(2.03)	(1.54)	(1.42)	(1.79)	(2.66)	(1.72)
READING COMPREHENSION	4.47	4.56	4.41	6.44	6.09	6.26	6.24	6.76	5.69
GRADE EQUIVALENT	(0.70)	(0.62)	(0.55)	(2.55)	(2.65)	(2.04)	(2.28)	(3.01)	(2.36)
MATH COMPUTATION	4.43	4.60	4.39	5.89	5.83	5.75	6.55	6.51	6.25
GRADE EQUIVALENT	(0.69)	(0.95)	(0.67)	(1.36)	(1.24)	(1.30)	(1.48)	(1.28)	(1.69)
CONCEPT APPLICATION	4.78	5.06	4.55	6.34	5.96	6.23	7.41	7.03	6.34
GRADE EQUIVALENT	(1.14)	(1.23)	(0.93)	(1.97)	(1.99)	(1.58)	(2.24)	(1.69)	(2.17)

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* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	PRE			POST YEAR 2			MAINTENANCE		
GRADE 4 AVERAGE	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	2.78	2.75	2.43	2.86	2.88	2.64	2.87	3.02	2.70
	(0.47)	(0.60)	(0.56)	(0.62)	(0.63)	(0.46)	(0.41)	(0.60)	(0.68)
SOCIAL	2.85	2.89	2.58	2.84	3.09	2.77	2.89	3.09	2.81
	(0.70)	(0.65)	(0.60)	(0.62)	(0.56)	(0.50)	(0.64)	(0.51)	(0.71)
PHYSICAL	2.73	2.76	2.43	2.85	2.91	2.60	2.95	2.88	2.65
	(0.72)	(0.52)	(0.67)	(0.67)	(0.57)	(0.53)	(0.68)	(0.57)	(0.73)
GENERAL	2.80	3.01	2.71	3.01	3.05	2.77	3.02	3.07	2.82
	(0.53)	(0.60)	(0.71)	(0.62)	(0.60)	(0.55)	(0.56)	(0.59)	0.60
SELF CONCEPT: COOPERSMITH									
SCHOOL	5.50	5.14	5.14	4.89	5.03	4.90	5.19	4.93	4.86
	(1.58)	(1.66)	(2.03)	(1.80)	(1.73)	(1.82)	(2.18)	(2.15)	(2.17)
GENERAL	16.42	17.07	15.82	16.27	18.45	18.18	18.46	18.03	18.79
	(4.27)	(4.44)	(5.27)	(4.94)	(3.90)	(4.18)	(4.77)	(5.45)	(4.07)
LOCUS OF CONTROL									
INTERNAL	24.50	24.43	25.03	25.13	25.40	22.90	26.30	27.46	26.09
	(4.46)	(4.70)	(2.99)	(2.95)	(4.42)	(5.96)	(2.05)	(3.00)	(2.87)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 4 AVERAGE	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	7.07	8.05	7.71	6.55	6.65	5.68	7.45	7.62	7.64
	(3.28)	(2.72)	(2.20)	(2.35)	(1.42)	(2.24)	(2.54)	(2.64)	(2.52)
CORRECT	5.48	6.27	6.07	7.00	7.24	6.29	0.98	3.89	0.29
	(2.40)	(2.42)	(1.73)	(2.58)	(2.06)	(2.75)	(2.18)	(2.72)	(0.45)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	3.20	3.00	2.88	3.10	3.43	2.06	3.40	3.75	2.69
	(1.36)	(1.87)	(1.32)	(1.41)	(1.29)	(1.64)	(1.43)	(1.09)	(1.21)
STORY 2	1.35	1.93	1.75	2.25	2.43	1.81	2.30	2.61	1.69
	(1.68)	(1.71)	(1.30)	(1.34)	(1.61)	(1.29)	(1.55)	(1.32)	(1.40)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 AVERAGE	POST YEAR 1 IE	POST YEAR 1 SPELT	POST YEAR 1 CONTROL	POST YEAR 2 IE	POST YEAR 2 SPELT	POST YEAR 2 CONTROL	MAINTENANCE IE	MAINTENANCE SPELT	MAINTENANCE CONTROL
PERCEIVED PROB. SOLVING							103.37 (11.94)	102.62 (9.96)	101.54 (10.27)
MATH STRATEGIES									
REREADING	0.66 * (0.83)	1.20 (0.86)	0.58 (0.72)	1.29 (0.81)	1.24 (0.81)	1.36 (0.79)	1.34 (0.79)	1.68 (0.55)	1.22 (0.85)
STATING PLANS	0.17 (0.51)	0.64 (0.79)	0.22 (0.53)	0.11 (0.32)	0.40 (0.40)	0.19 (0.52)	0.20 (0.47)	0.43 (0.69)	0.27 (0.78)
GUESSING & CHECKING	0.17 (0.45)	0.40 (0.57)	0.11 (0.46)	0.23 (0.48)	0.36 (0.48)	0.44 (0.50)	0.63 (0.72)	0.40 (0.57)	1.00 (0.78)
MANIPULATIVES	0.94 (0.79)	1.04 (0.82)	0.69 (0.76)	0.40 (0.69)	0.48 (0.70)	0.33 (0.58)	0.54 (0.69)	0.48 (0.64)	0.92 (0.76)
REASONABLENESS OF ANSWER	0.14 (0.35)	0.16 (0.37)	0.14 (0.42)	0.14 (0.35)	0.32 (0.55)	0.14 (0.42)	0.26 (0.50)	0.20 (0.49)	0.11 (0.39)
ALTERNATIVES	0.17 (0.51)	0.40 (0.63)	0.11 (0.39)	0.17 (0.45)	0.40 (0.57)	0.11 (0.31)	0.54 (0.69)	0.44 (0.64)	0.42 (0.64)
METACOGNITIVE READING	28.75 (5.49)	32.33 (3.86)	27.86 (5.84)	30.75 (3.96)	32.07 (5.41)	28.57 (5.23)	30.25 (4.71)	33.93 (4.01)	31.00 (2.51)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 GIFTED	PRE IE	PRE SPELT	PRE CONTROL	POST YEAR 2 IE	POST YEAR 2 SPELT	POST YEAR 2 CONTROL	MAINTENANCE IE	MAINTENANCE SPELT	MAINTENANCE CONTROL
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	123.86	124.03	127.83				111.67	119.50	120.00
STANDARD SCORES	(8.96)	(7.97)	(11.43)				(15.00)	(9.21)	(11.68)
NONVERBAL	121.98	123.36	121.66				109.60	117.00	113.46
STANDARD SCORES	(11.32)	(8.85)	(11.78)				(20.27)	(12.32)	(12.05)
QUANTITATIVE	118.14	122.25	119.03				104.76	116.44	109.40
STANDARD SCORES	(10.33)	(9.85)	(10.25)				(14.96)	(13.46)	(11.72)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	7.06	7.40	7.27	8.97	9.42	9.47	9.86	10.10	9.68
GRADE EQUIVALENT	(1.85)	(1.51)	(1.39)	(1.95)	(1.58)	(1.70)	(1.88)	(1.69)	(2.10)
READING COMPREHENSION	9.22	9.82	9.52	10.50	11.12	10.92	10.76	10.41	10.86
GRADE EQUIVALENT	(2.11)	(2.00)	(1.66)	(2.38)	(1.73)	(1.88)	(2.35)	(2.00)	(2.16)
MATH COMPUTATION	5.10	5.40	5.13	6.96	6.95	7.08	7.79	7.82	7.89
GRADE EQUIVALENT	(0.82)	(1.12)	(0.65)	(1.27)	(1.34)	(1.27)	(1.65)	(1.31)	(1.13)
CONCEPT APPLICATION	6.41	6.84	6.44	8..24	8.65	8.22	9.24	9.61	9.21
GRADE EQUIVALENT	(1.22)	(1.32)	(1.14)	(1.60)	(1.31)	(1.63)	(2.30)	(1.71)	(1.55)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	PRE			POST YEAR 2			MAINTENANCE		
GRADE 4 GIFTED	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	3.20	3.27	3.00	3.29	3.26	3.19	3.34	3.26	3.21
	(0.46)	(0.41)	(0.59)	(0.79)	(0.43)	(0.49)	(0.48)	(0.43)	(0.54)
SOCIAL	2.92	2.93	2.73	3.01	3.04	2.91	3.14	2.97	2.98
	(0.55)	(0.73)	(0.58)	(0.76)	(0.52)	(0.57)	(0.51)	(0.51)	(0.55)
PHYSICAL	2.77	2.97	2.65	2.84	3.03	2.81	2.94	2.98	2.83
	(0.67)	(0.62)	(0.65)	(0.77)	(0.58)	(0.64)	(0.66)	(0.62)	(0.57)
GENERAL	3.11	3.04	2.89	3.10	2.99	2.98	3.22	3.09	2.91
	(0.48)	(0.47)	(0.68)	(0.82)	(0.42)	(0.57)	(0.53)	(0.44)	(0.62)
SELF CONCEPT: COOPERSMITH									
SCHOOL	6.00	5.83	5.91	6.57	5.70	6.38	6.33	5.70	6.22
	(1.45)	(1.88)	(1.79)	(1.79)	(1.77)	(2.72)	(1.61)	(1.77)	(1.43)
GENERAL	19.81	18.93	18.81	19.81	19.50	20.44	20.19	19.73	20.53
	(2.91)	(4.25)	(5.18)	(5.54)	(3.50)	(4.26)	(3.00)	(4.07)	(4.39)
LOCUS OF CONTROL									
INTERNAL	24.70	24.74	25.71	25.26	27.00	25.68	26.36	26.57	26.34
	(5.40)	(4.23)	(3.40)	(3.35)	(3.06)	(4.00)	(4.29)	(3.06)	(1.98)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 GIFTED	POST YEAR 1			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	6.52	6.86	6.22	8.19	7.16	6.46	9.63	7.95	5.84
	(2.28)	(2.18)	(1.86)	(2.06)	(1.72)	(2.20)	(3.72)	(3.10)	(3.45)
CORRECT	9.19	8.73	7.81	12.15	11.73	10.70	3.48	4.78	1.03
	(2.74)	(2.34)	(3.10)	(2.26)	(2.25)	(3.46)	(4.04)	(3.89)	(0.79)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	2.84	3.03	2.91	3.79	3.97	3.05	2.74	3.03	3.00
	(1.46)	(1.20)	(1.51)	(1.06)	(1.01)	(1.52)	(1.02)	(1.12)	(1.38)
STORY 2	2.00	2.24	1.46	2.21	2.68	2.14	3.42	3.94	2.64
	(1.21)	(1.35)	(1.31)	(1.20)	(1.16)	(1.52)	(1.27)	(1.21)	(1.40)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 4 GIFTED	POST YEAR 1			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED PROB. SOLVING							105.40 (12.40)	110.31 (10.95)	105.64 (13.54)
MATH STRATEGIES									
REREADING	0.55 (0.84)	0.78 (0.79)	0.71 (0.85)	1.23 (0.73)	1.39 (0.59)	1.21 (0.83)	1.00 (0.91)	1.56 (0.69)	1.24 (0.81)
STATING PLANS	0.23 (0.52)	0.39 (0.68)	0.41 (0.69)	0.14 (0.34)	0.06 (0.23)	0.19 (0.50)	0.32 (0.63)	0.39 (0.68)	0.62 (0.82)
GUESSING & CHECKING	1.05 (0.82)	0.89 (0.66)	0.86 (0.80)	0.14 (0.46)	0.28 (0.45)	0.26 (0.54)	0.18 (0.39)	0.61 (0.68)	0.50 (0.70)
MANIPULATIVES	0.23 (0.42)	0.24 (0.42)	0.43 (0.62)	0.36 (0.57)	0.28 (0.56)	0.45 (0.54)	0.59 (0.72)	0.89 (0.74)	0.71 (0.67)
REASONABLENESS OF ANSWER	0.32 (0.47)	0.32 (0.44)	0.31 (0.46)	0.52 (0.66)	0.50 (0.60)	0.48 (0.66)	0.32 (0.70)	1.06 (0.71)	0.79 (0.80)
ALTERNATIVES	0.12 (0.34)	0.22 (0.46)	0.21 (0.41)	0.32 (0.63)	0.39 (0.49)	0.26 (0.49)	0.61 (0.78)	0.37 (0.47)	0.14 (0.35)
METACOGNITIVE READING	31.18 (4.26)	34.06 (4.17)	32.00 (3.46)	33.09 (2.07)	32.88 (4.17)	31.88 (3.59)	33.36 (3.45)	31.56 (4.56)	29.00 (5.50)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 LD	PRE IE	PRE SPELT	PRE CONTROL	POST YEAR 2 IE	POST YEAR 2 SPELT	POST YEAR 2 CONTROL	MAINTENANCE IE	MAINTENANCE SPELT	MAINTENANCE CONTROL
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	94.55	98.47	93.86				92.03	97.16	93.40
STANDARD SCORES	(5.89)	(5.54)	(7.62)				(7.03)	(6.76)	(9.69)
NONVERBAL	98.78	103.21	98.54				101.31	108.26	99.78
STANDARD SCORES	(9.73)	(7.16)	(9.67)				(12.43)	(5.27)	(12.73)
QUANTITATIVE	96.35	100.00	95.16				94.86	105.95	94.68
STANDARD SCORES	(9.43)	(9.59)	(9.85)				(12.05)	(12.99)	(13.00)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	5.27	5.70	5.39	7.73	8.85	7.67*	7.74	9.50	7.66
GRADE EQUIVALENT	(1.01)	(1.54)	(1.54)	(2.24)	(2.20)	(2.44)	(2.35)	(1.79)	(1.86)
READING COMPREHENSION	3.39	4.20	3.56	6.47	7.59	5.87	4.35	6.91	5.64
GRADE EQUIVALENT	(0.70)	(0.61)	(0.97)	(2.47)	(2.59)	(3.25)	(1.99)	(2.97)	(2.45)
MATH COMPUTATION	6.27	6.09	6.17	9.02	8.14	8.30	8.54	9.11	9.56
GRADE EQUIVALENT	(1.43)	(1.44)	(1.11)	(2.37)	(1.91)	(1.77)	(2.27)	(2.14)	(2.17)
CONCEPT APPLICATION	6.83	6.31	6.69	9.80	8.31	8.82	8.26	9.41	9.16
GRADE EQUIVALENT	(2.13)	(1.72)	(1.62)	(2.49)	(1.94)	(2.06)	(2.97)	(2.05)	(2.23)

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* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	PRE			POST YEAR 2			MAINTENANCE		
GRADE 7 LD	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	3.13	2.65	2.77	2.78	2.57	2.55	2.78	2.71	2.56
	* (0.55)	(0.44)	(0.47)	(0.64)	(0.47)	(0.45)	(0.76)	(0.43)	(0.43)
SOCIAL	3.16	2.93	2.95	3.27	2.9	2.9	3.27	3.07	3.02
	(0.57)	(0.47)	(0.72)	(0.47)	(0.38)	(0.61)	(0.54)	(0.48)	(0.51)
PHYSICAL	2.91	2.97	2.83	2.86	3.07	2.79	2.80	3.18	2.81
	(0.59)	(0.61)	(0.80)	(0.58)	(0.45)	(0.65)	(0.61)	(0.46)	(0.72)
GENERAL	2.88	2.75	2.99	2.97	2.80	2.88	3.15	2.83	2.94
	(0.61)	(0.45)	(0.59)	(0.51)	(0.35)	(0.49)	(0.59)	(0.43)	(0.47)
SELF CONCEPT: COOPERSMITH									
SCHOOL	4.64	4.81	4.60	4.50	3.48	4.62	4.43	4.62	4.05
	(2.06)	(1.76)	(1.97)	(2.13)	(1.89)	(1.84)	(2.20)	(2.24)	(1.99)
GENERAL	16.79	17.81	18.51	19.29	17.38	19.19	21.00	19.96	19.62
	(4.96)	(4.15)	(4.77)	(4.82)	(5.70)	(4.12)	(3.30)	(4.59)	(4.86)
LOCUS OF CONTROL									
INTERNAL	23.25	25.50	24.05	26.19	26.27	24.06	27.06	25.95	25.77
	(3.37)	(2.32)	(4.77)	(3.65)	(2.73)	(4.35)	(2.21)	(3.50)	(3.50)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 LD	POST YEAR 1			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	6.16	8.39	7.75	7.80	8.11	8.28	6.00	6.72	6.34
	(3.15)	(1.60)	(2.08)	(2.87)	(1.94)	(2.43)	(1.98)	(2.75)	(2.06)
CORRECT	7.84	10.00	8.44	6.68	9.33	8.25	4.28	10.22	7.50
	(4.04)	(2.63)	(3.64)	(2.11)	(1.73)	(2.46)	(3.83)	(1.93)	(4.95)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	3.05	2.96	2.27	2.65	3.57	2.27	3.45	4.04	3.63
	(1.60)	(0.98)	(1.41)	(1.15)	(0.88)	(1.37)	(1.75)	(0.96)	(1.62)
STORY 2	2.20	2.13	1.70	3.30	3.78	2.67	2.80	2.35	2.60
	(1.17)	(1.08)	(1.46)	(1.45)	(1.14)	(1.58)	(1.21)	(1.24)	(1.50)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 7 LD	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED PROB. SOLVING							102.41 (11.70)	96.44 (11.31)	100.89 (9.60)
MATH STRATEGIES									
REREADING	1.17 * (0.79)	1.16 (0.73)	0.93 (0.83)	1.03 (0.89)	1.44 (0.70)	1.29 (0.79)	1.31 (0.88)	1.28 (0.72)	1.07 (0.85)
STATING PLANS	0.17 (0.53)	0.20 (0.40)	0.28 (0.51)	0.03 (0.18)	0.44 (0.70)	0.60 (0.74)	0.41 (0.72)	0.08 (0.39)	0.36 (0.70)
GUESSING & CHECKING	0.31 (0.46)	0.32 (0.55)	0.33 (0.52)	0.41 (0.59)	0.68 (0.73)	0.62 (0.68)	0.66 (0.60)	0.60 (0.63)	0.67 (0.70)
MANIPULATIVES	0.90 (0.85)	0.36 (0.69)	0.76 (0.77)	0.31 (0.59)	0.60 (0.85)	0.31 (0.63)	0.31 (0.65)	0.24 (0.59)	0.24 (0.56)
REASONABLENESS OF ANSWER	0.28 (0.45)	0.44 (0.50)	0.09 (0.29)	0.35 (0.48)	0.28 (0.53)	0.13 (0.34)	0.24 (0.50)	0.16 (0.37)	0.18 (0.44)
ALTERNATIVES	0.41 (0.62)	0.36 (0.56)	0.42 (0.72)	0.59 (0.67)	0.68 (0.68)	0.56 (0.72)	0.55 (0.77)	0.46 (0.65)	0.53 (0.72)
METACOGNITIVE READING	30.75 (5.26)	33.12 (4.04)	31.32 (4.80)	32.25 (6.02)	34.06 (4.04)	29.37 (4.23)	33.13 (6.77)	32.12 (3.80)	31.11 (4.76)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 AVERAGE	PRE			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	100.28	105.90	101.44				104.08	110.20	102.72
STANDARD SCORES	(6.84)	(4.74)	(6.66)				(9.03)	(8.78)	(9.90)
NONVERBAL	100.00	103.60	99.67				101.56	113.40	108.78
STANDARD SCORES	(9.09)	(11.67)	(9.26)				(9.31)	(13.63)	(11.61)
QUANTITATIVE	95.24	104.10	97.78				98.32	113.60	102.08
STANDARD SCORES	(8.54)	(9.45)	(9.21)				(8.71)	(10.66)	(11.19)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	6.86	7.53	7.24	9.27	10.02	9.42	9.67	10.23	10.44
GRADE EQUIVALENT	(1.20)	(1.33)	(1.35)	(1.36)	(1.77)	(1.87)	(2.15)	(2.06)	(1.37)
READING COMPREHENSION	7.59	7.34	7.40	10.46	9.77	9.34	10.41	9.31	9.11
GRADE EQUIVALENT	(0.90)	(1.20)	(1.05)	(2.24)	(2.18)	(2.69)	(3.25)	(2.56)	(2.98)
MATH COMPUTATION	6.80	6.14	6.19	8.45	8.63	8.38	8.76	8.51	9.53
GRADE EQUIVALENT	(1.11)	(1.01)	(1.10)	(1.25)	(2.08)	(1.61)	(1.95)	(4.99)	(2.20)
CONCEPT APPLICATION	7.24	7.65	7.81	9.89	9.73	9.88	9.66	9.96	9.70
GRADE EQUIVALENT	(1.29)	(1.29)	(1.02)	(1.80)	(1.80)	(1.40)	(2.53)	(2.53)	(1.56)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	PRE			POST YEAR 2			MAINTENANCE		
GRADE 7 AVERAGE	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	2.85	2.77	2.91	2.86	2.79	2.97	2.95	2.89	2.94
	* (0.58)	(0.35)	(0.53)	(0.51)	(0.41)	(0.42)	(0.51)	(0.48)	(0.50)
SOCIAL	3.02	2.83	2.70	3.19	2.92	3.03	3.20	2.94	3.17
	(0.70)	(0.49)	(0.60)	(0.48)	(0.50)	(0.56)	(0.44)	(0.74)	(0.64)
PHYSICAL	3.01	3.00	2.94	3.00	2.96	2.97	3.04	3.08	3.12
	(0.60)	(0.56)	(0.61)	(0.46)	(0.61)	(0.67)	(0.56)	(0.67)	(0.66)
GENERAL	3.04	2.74	2.65	2.97	3.07	2.84	3.04	3.04	3.07
	(0.51)	(0.50)	(0.75)	(0.41)	(0.58)	(0.56)	(0.35)	(0.46)	(0.60)
SELF CONCEPT: COOPERSMITH									
SCHOOL	5.62	4.40	4.88	4.92	4.73	4.81	4.31	4.60	5.31
	(1.98)	(1.36)	(1.83)	(1.86)	(1.65)	(1.63)	(1.90)	(1.58)	(1.40)
GENERAL	20.46	17.27	19.00	21.08	19.27	18.81	18.92	18.00	22.06
	(4.01)	(3.75)	(4.20)	(3.34)	(4.80)	(4.11)	(5.03)	(4.96)	(3.77)
LOCUS OF CONTROL									
INTERNAL	26.73	25.08	27.28	27.42	27.40	26.62	26.58	27.08	27.84
	(1.87)	(5.61)	(3.51)	(2.75)	(3.38)	(4.22)	(1.16)	(3.16)	(3.67)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 AVERAGE	POST YEAR 1			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	6.16	8.39	7.75	7.80	7.83	8.28	6.00	6.72	6.34
	(3.15)	(1.60)	(2.08)	(2.87)	(2.27)	(2.47)	(1.98)	(2.75)	(2.06)
CORRECT	7.84	10.00	10.44	11.63	11.33	11.25	2.28	10.22	7.24
	(4.04)	(2.63)	(3.64)	(2.11)	(2.39)	(2.46)	(3.83)	(1.93)	(4.95)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	1.56	2.43	1.90	3.88	4.10	3.84	3.00	3.19	3.39
	(1.50)	(1.09)	(1.20)	(1.58)	(1.19)	(1.57)	(1.41)	(0.91)	(1.18)
STORY 2	2.06	2.57	2.23	2.25	3.14	2.55	2.56	3.38	2.05
	(1.75)	(1.71)	(1.43)	(1.09)	(1.70)	(1.01)	(1.37)	(1.40)	(1.43)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 7 AVERAGE	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED PROB. SOLVING							103.81	98.88	104.12
							(10.84)	(12.28)	(11.85)
MATH STRATEGIES									
REREADING	0.96	0.93	0.93	1.35	1.07	1.48	1.42	1.00	1.03
*	(0.85)	(0.77)	(0.93)	(0.73)	(0.68)	(0.71)	(0.89)	(0.82)	(0.82)
STATING PLANS	0.42	0.27	0.30	0.27	0.33	0.68	0.27	0.13	0.50
	(0.74)	(0.57)	(0.64)	(0.59)	(0.70)	(0.82)	(0.59)	(0.34)	(0.74)
GUESSING & CHECKING	0.65	0.40	0.70	0.50	0.67	0.38	0.19	0.00	0.30
	(0.78)	(0.61)	(0.75)	(0.69)	(0.70)	(0.62)	(0.48)	(0.00)	(0.64)
MANIPULATIVES	0.46	0.33	0.28	0.50	0.80	0.60	0.62	0.40	0.55
	(0.57)	(0.47)	(0.50)	(0.57)	(0.54)	(0.74)	(0.56)	(0.49)	(0.67)
REASONABLENESS OF ANSWER	0.58	0.13	0.45	0.42	1.00	0.53	0.85	0.07	0.40
	(0.75)	(0.34)	(0.74)	(0.69)	(0.73)	(0.71)	(0.82)	(0.25)	(0.62)
ALTERNATIVES	0.31	0.20	0.35	0.31	0.27	0.40	0.31	0.12	0.20
	(0.54)	(0.54)	(0.57)	(0.46)	(0.44)	(0.58)	(0.54)	(0.18)	(0.51)
METACOGNITIVE READING	35.11	33.18	31.63	34.67	34.46	33.13	33.33	33.73	33.06
	(4.86)	(3.01)	(5.42)	(2.50)	(3.89)	(4.05)	(3.62)	(3.19)	(3.33)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	PRE			POST YEAR 2			MAINTENANCE		
GRADE 7 GIFTED	**IE**	**SPELT**	**CONTROL**	**IE**	**SPELT**	**CONTROL**	**IE**	**SPELT**	**CONTROL**
CANADIAN COGNITIVE ABILITIES TEST									
VERBAL	118.76	123.46	121.32				123.76	122.39	117.92
STANDARD SCORES	(8.00)	(7.32)	(8.40)				(11.13)	(7.96)	(12.87)
NONVERBAL	119.43	120.86	115.84				123.00	128.11	115.08
STANDARD SCORES	(9.81)	(8.06)	(12.34)				(10.84)	(9.88)	(16.16)
QUANTITATIVE	117.10	118.82	112.56				116.05	121.36	106.08
STANDARD SCORES	(11.24)	(11.35)	(13.00)				(9.28)	(10.98)	(13.23)
CANADIAN ACHIEVEMENT TEST									
READING VOCABULARY	10.04	10.26	10.03	12.33	12.35	12.31	11.95	12.51	12.23
GRADE EQUIVALENT	(1.99)	(1.77)	(1.83)	(0.85)	(1.04)	(1.05)	(1.24)	(0.89)	(0.89)
READING COMPREHENSION	11.69	11.91	11.74	12.21	12.13	12.22	11.39	12.43	12.23
GRADE EQUIVALENT	(0.89)	(0.96)	(1.08)	(1.09)	(1.49)	(1.03)	(2.95)	(1.34)	(1.40)
MATH COMPUTATION	8.43	7.81	8.13	11.37	10.82	10.74	11.07	11.49	12.34
GRADE EQUIVALENT	(0.92)	(1.06)	(1.64)	(1.28)	(1.88)	(1.41)	(1.96)	(2.00)	(0.77)
CONCEPT APPLICATION	10.40	9.68	10.53	12.34	11.78	11.65	11.93	12.01	11.68
GRADE EQUIVALENT	(1.44)	(1.47)	(1.69)	(0.63)	(1.56)	(1.40)	(1.49)	(1.32)	(1.18)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 GIFTED	IE	PRE SPELT	CONTROL	IE	POST YEAR 2 SPELT	CONTROL	IE	MAINTENANCE SPELT	CONTROL
PERCEIVED COMPETENCE: HARTER									
COGNITIVE	3.39	3.36	3.41	3.52	3.35	3.40	3.28	3.36	3.38
	* (0.40)	(0.38)	(0.51)	(0.37)	(0.40)	(0.55)	(0.44)	(0.45)	(0.47)
SOCIAL	2.92	2.94	3.10	2.84	2.94	3.18	3.00	3.09	3.10
	(0.54)	(0.59)	(0.55)	(0.71)	(0.48)	(0.51)	(0.52)	(0.40)	(0.51)
PHYSICAL	2.75	2.70	2.81	2.83	2.68	2.91	2.68	2.80	2.79
	(0.58)	(0.65)	(0.70)	(0.54)	(0.62)	(0.73)	(0.59)	(0.65)	(0.65)
GENERAL	3.11	2.93	3.37	3.16	3.08	3.28	3.12	3.19	3.07
	(0.39)	(0.69)	(0.47)	(0.33)	(0.47)	(0.45)	(0.47)	(0.41)	(0.52)
SELF CONCEPT: COOPERSMITH									
SCHOOL	5.75	6.48	5.80	5.90	5.83	5.40	5.65	4.62	5.80
	(2.12)	(1.48)	(2.04)	(1.67)	(1.58)	(1.36)	(1.65)	(1.97)	(1.54)
GENERAL	19.45	20.86	19.40	23.50	20.52	20.60	21.35	20.59	21.50
	(6.11)	(3.09)	(5.43)	(4.14)	(4.30)	(2.84)	(3.35)	(3.79)	(3.79)
LOCUS OF CONTROL									
INTERNAL	26.47	23.98	25.18	26.89	26.62	25.95	27.24	26.27	26.59
	(2.67)	(4.55)	(3.61)	(4.17)	(4.10)	(3.67)	(2.82)	(3.44)	(1.92)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

	POST YEAR 1			POST YEAR 2			MAINTENANCE		
GRADE 7 GIFTED	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
CLOZE									
SYNONYMS	6.60 (3.22)	9.00 (2.19)	9.24 (3.27)	9.90 (2.79)	9.97 (2.21)	9.12 (3.82)	8.20 (2.42)	4.63 (2.15)	5.44 (3.45)
CORRECT	7.75 (4.15)	10.18 (2.94)	10.32 (3.25)	11.60 (2.22)	11.53 (2.90)	11.12 (2.52)	2.35 (3.18)	9.97 (2.76)	6.76 (4.44)
COMPREHENSION MONITORING: ERROR DETECTION									
STORY 1	3.33 (1.59)	4.72 (1.24)	3.62 (1.59)	4.00 (1.35)	3.89 (1.15)	3.42 (1.33)	5.00 (1.08)	4.31 (1.13)	3.91 (1.57)
STORY 2	1.83 (1.21)	2.33 (1.51)	2.00 (1.38)	3.58 (1.32)	4.17 (1.50)	3.33 (1.94)	4.17 (1.52)	3.64 (1.78)	2.00 (1.63)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

GRADE 7 GIFTED	POST YEAR 1			POST YEAR 2			MAINTENANCE		
	IE	SPELT	CONTROL	IE	SPELT	CONTROL	IE	SPELT	CONTROL
PERCEIVED PROB. SOLVING							114.19	110.34	106.66
							(11.74)	(13.58)	(11.06)
MATH STRATEGIES									
REREADING	0.61	1.14	0.93	1.09	1.05	1.39	1.70	0.89	0.82
	* (0.82)	(0.84)	(0.88)	(0.83)	(0.80)	(0.82)	(0.62)	(0.76)	(0.80)
STATING PLANS	0.39	0.27	0.32	0.17	0.54	0.57	0.61	0.14	0.29
	(0.77)	(0.55)	(0.66)	(0.38)	(0.76)	(0.73)	(0.87)	(0.34)	(0.59)
GUESSING & CHECKING	0.57	0.68	0.57	0.70	0.51	0.61	0.78	0.57	0.57
	(0.58)	(0.62)	(0.56)	(0.62)	(0.50)	(0.67)	(0.51)	(0.55)	(0.50)
MANIPULATIVES	1.04	0.46	0.79	0.26	0.46	0.36	0.22	0.27	0.21
	(0.75)	(0.72)	(0.94)	(0.53)	(0.68)	(0.61)	(0.51)	(0.50)	(0.56)
REASONABLENESS OF ANSWER	0.65	0.68	0.54	0.74	1.34	0.62	0.78	0.11	0.21
	(0.81)	(0.70)	(0.68)	(0.85)	(0.79)	(0.79)	(0.88)	(0.39)	(0.56)
ALTERNATIVES	0.17	0.22	0.46	0.57	0.30	0.25	0.17	0.14	0.21
	(0.38)	(0.41)	(0.50)	(0.71)	(0.46)	(0.50)	(0.38)	(0.41)	(0.42)
METACOGNITIVE READING	33.67	34.79	30.65	34.02	34.50	31.37	35.47	35.62	32.22
	(3.54)	(3.40)	(4.19)	(3.70)	(3.38)	(4.42)	(1.11)	(2.53)	(2.44)

* NUMBER IN PARENTHESIS INDICATE STANDARD DEVIATIONS.

APPENDIX F

Anova Tables

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Pretest Tables

Table 1

Two Way ANOVA: Grade 4 verbal Ability: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	49.000	0.693	0.501
B diagnostic	2	25672.500	362.846	0.000
AB	4	130.250	1.841	0.121
Error	328	70.979		
Total	336	223.723		

Table 2

Two Way ANOVA : Grade 4 nonverbal ability: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	279.500	2.306	0.101
B diagnostic	2	16278.500	134.291	0.001
AB	4	187.750	1.549	0.188
Error	326	121.218		
Total	334	219.713		

Table 3

Two Way ANOVA: Grade 4 reading total scale scores: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	400.000	0.312	0.732
B diagnostic	2	530752.720	258.400	0.000
AB	4	496.000	0.387	0.818
Error	261	1280.184		
Total	269	3711.940		

Table 4

Two Way ANOVA: Grade 4 math total scale scores: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	2544.000	0.880	0.416
B diagnostic	2	87024.000	30.117	0.000
AB	4	2464.000	0.853	0.493
Error	261	2889.563		
Total	269	3506.201		

Table 5

Two Way ANOVA: Grade 4 Teacher ratings (learning characteristics): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	62.875	2.432	0.089
B diagnostic	2	2592.969	100.312	0.000
AB	4	17.109	0.662	0.619
Error	355	25.849		
Total	363	40.101		

Table 6

Two Way ANOVA: Grade 4 Teacher ratings (motivation): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	53.594	2.307	0.101
B diagnostic	2	1163.438	50.087	0.000
AB	4	14.016	0.603	0.660
Error	355	23.228		
Total	363	29.576		

Table 7

Two Way ANOVA: Grade 4 Teacher ratings (creativity): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A	2	93.125	2.680	0.070
B	2	1364.219	39.259	0.000
AB	4	17.500	0.504	0.733
Error	355	34.749		
Total	363	42.206		

Table 8

Two Way ANOVA: Grade 7 verbal Ability: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	2	135.000	2.503	0.084
B diagnostic	2	15881.000	294.400	0.000
AB	4	24.750	0.459	0.766
0 Error	301	53.944		
Total	309	156.531		

Table 9

Two Way ANOVA: Grade 7 nonverbal Ability: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A	1	106.000	1.022	0.313
B	2	5954.000	57.423	0.000
AB	2	66.500	0.641	0.528
0 Error	208	103.688		
Total	213	158.282		

Table 10

Two Way ANOVA: Grade 7 reading total scale scores: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	1	416.000	0.422	0.517
B diagnostic	2	211873.02	215.100	0.000
AB	2	24.000	0.024	0.976
Error	109	984.954		
Total	114	4662.734		

Table 11

Two Way ANOVA: Grade 7 math total scale scores: Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A	1	656.000	0.399	0.529
B	2	82488.000	50.125	0.000
AB	2	24.000	0.015	0.986
Error	109	1645.651		
Total	114	3026.807		

Table 12

Two Way ANOVA: Grade 7 Teacher ratings (learning characteristics): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	1	11.352	0.496	0.482
B diagnostic	2	2285.693	99.958	0.000
AB	2	0.559	0.024	0.976
Error	186	22.866		
Total	191	46.267		

Table 13

Two Way ANOVA: Grade 7 Teacher ratings (motivation): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A group	1	94.238	4.580	0.034
B diagnostic	2	1660.492	80.695	0.000
AB	2	32.813	1.595	0.206
Error	186	20.577		
Total	191	38.263		

Table 14

Two Way ANOVA: Grade 7 Teacher ratings (creativity): Pretest

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
A	1	106.500	3.274	0.072
B	2	1551.219	47.691	0.000
AB	2	75.688	2.327	0.100
Error	186	32.526		
Total	191	49.268		

Post-test Tables

Table 15

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: verbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	88			
(A) Group	2	597.700	3.764	0.027
Subjects within Group	86	158.791		
Within Subjects	89			
(B) Time	1	158.825	1.922	0.169
AB	2	167.756	2.030	0.138
B X Subject within Group	86	82.651		

Table 16

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Nonverbal ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	467.512	2.614	0.079
Subjects within Group	85	178.824		
Within Subjects	88			
(B) Time	1	513.950	6.748	0.011
AB	2	74.251	0.975	0.381
B X Subject within Group	85	76.165		

Table 17

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Quantitative ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	601.173	2.873	0.062
Subjects within Group	85	209.247		
Within Subjects	88			
(B) Time	1	94.492	1.488	0.226
AB	2	260.862	4.108	0.020
B X Subject within Group	85	63.494		

Table 18

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Reading vocabulary

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	71			
(A) Group	2	1.799	0.455	0.637
Subjects within Group	69	3.957		
Within Subjects	144			
(B) Time	2	65.565	47.427	0.000
AB	4	1.172	0.848	0.497
B X Subject within Group	138	1.382		

Table 19

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Reading comprehension

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	71			
(A) Group	2	12.575	2.748	0.071
Subjects within Group	69	4.577		
Within Subjects	144			
(B) Time	2	86.595	49.056	0.000
AB	4	4.012	2.273	0.065
B X Subject within Group	138	1.765		

Table 20

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	72			
(A) Group	2	0.873	0.342	0.711
Subjects within Group	70	2.552		
Within Subjects	146			
(B) Time	2	57.317	61.306	0.000
AB	4	1.395	1.492	0.208
B X Subject within Group	140	0.935		

Table 21

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Math concepts and application

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	72			
(A) Group	2	12.338	2.461	0.093
Subjects within Group	70	5.013		
Within Subjects	146			
(B) Time	2	54.419	40.674	0.000
AB	4	4.393	3.284	0.013
B X Subject within Group	140	1.338		

Table 22

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	65			
(A) Group	2	0.942	1.677	0.195
Subjects within Group	63	0.562		
Within Subjects	132			
(B) Time	2	0.125	0.720	0.489
AB	4	0.311	1.793	0.134
B X Subject within Group	126	0.174		

Table 23

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	64			
(A) Group	2	1.434	2.477	0.092
Subjects within Group	62	0.579		
Within Subjects	130			
(B) Time	2	0.059	0.322	0.725
AB	4	0.416	2.277	0.065
B X Subject within Group	124	0.183		

Table 24

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.280	0.427	0.655
Subjects within Group	60	0.657		
Within Subjects	126			
(B) Time	2	0.126	0.522	0.595
AB	4	0.022	0.091	0.985
B X Subject within Group	120	0.242		

Table 25

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	61			
(A) Group	2	0.962	1.867	0.164
Subjects within Group	59	0.515		
Within Subjects	124			
(B) Time	2	0.038	0.172	0.842
AB	4	0.470	2.136	0.081
B X Subject within Group	118			

Table 26

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	82			
(A) Group	2	18.613	3.541	0.034
Subjects within Group	80	5.256		
Within Subjects	166			
(B) Time	2	8.649	2.512	0.084
AB	4	6.004	1.744	0.143
B X Subject within Group	160	3.443		

Table 27

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	82			
(A) Group	2	203.703	4.779	0.011
Subjects within Group	80	42.627		
Within Subjects	166			
(B) Time	2	10.359	0.836	0.435
AB	4	11.884	0.959	0.431
B X Subject within Group	160	12.386		

Table 28

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	72			
(A) Group	2	47.354	1.802	0.173
Subjects within Group	70	26.277		
Within Subjects	146			
(B) Time	2	98.870	5.705	0.004
AB	4	54.915	3.169	0.016
B X Subject within Group	140	17.331		

Table 29

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	113.115	3.471	0.037
Subjects within Group	64	32.592		
Within Subjects	134			
(B) Time	2	34.508	1.996	0.140
AB	4	18.527	1.072	0.373
B X Subject within Group	128	17.288		

Table 30

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	8.112	1.661	0.197
Subjects within Group	72	4.883		
Within Subjects	150			
(B) Time	2	530.770	124.621	0.000
AB	4	9.896	2.323	0.059
B X Subject within Group	144	4.259		

Table 31

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	52.889	6.196	0.003
Subjects within Group	72	8.536		
Within Subjects	150			
(B) Time	2	205.077	45.682	0.000
AB	4	49.306	10.983	0.000
B X Subject within Group	144	4.489		

Table 32

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Comprehension monitoring at instructional level.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	70			
(A) Group	2	0.296	0.139	0.871
Subjects within Group	68	2.130		
Within Subjects	142			
(B) Time	2	9.432	4.846	0.009
AB	4	2.242	1.152	0.335
B X Subject within Group	136	1.947		

Table 33

Two Way ANOVA with the last factor repeated: Grade 4 learning disabled: Comprehension monitoring at frustration level.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	70			
(A) Group	2	5.086	2.780	0.069
Subjects within Group	68	1.830		
Within Subjects	142			
(B) Time	2	21.339	14.613	0.000
AB	4	0.679	0.465	0.761
B X Subject within Group	136	1.460		

Table 34

One Way ANOVA: Grade 4 learning disabled: Perceived problem solving.ability

Source	DF	MS	F	P
Groups	2	40.95	0.41	0.668
Error	97	100.92		

Table 35

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Re-reading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	60			
(A) Group	2	1.749	2.732	0.073
Subjects within Group	58	0.640		
Within Subjects	122			
(B) Time	2	5.572	9.752	0.000
AB	4	0.857	1.501	0.207
B X Subject within Group	116	0.571		

Table 36

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	1.978	5.918	0.005
Subjects within Group	60	0.334		
Within Subjects	126			
(B) Time	2	0.329	1.301	0.276
AB	4	0.477	1.884	0.118
B X Subject within Group	120	0.253		

Table 37

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.409	0.882	0.419
Subjects within Group	60	0.464		
Within Subjects	126			
(B) Time	2	5.294	11.055	0.000
AB	4	0.353	0.737	0.569
B X Subject within Group	120	0.479		

Table 38

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Guessing & checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.097	0.251	0.779
Subjects within Group	60	0.386		
Within Subjects	126			
(B) Time	2	3.689	10.941	0.000
AB	4	0.634	1.879	0.118
B X Subject within Group	120	0.337		

Table 39

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Alternative ways to solve problems.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.101	0.471	0.627
Subjects within Group	60	0.213		
Within Subjects	126			
(B) Time	2	0.600	3.076	0.050
AB	4	0.254	1.303	0.273
B X Subject within Group	120	0.195		

Table 40

Two Way ANOVA with last factor repeated: Grade 4 learning disabled: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.070	0.214	0.808
Subjects within Group	60	0.329		
Within Subjects	126			
(B) Time	2	2.500	9.494	0.000
AB	4	0.496	1.884	0.118
B X Subject within Group	120	0.263		

Table 41

Two Way ANOVA with last factor repeated: Grade 4 average: Verbal ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	118			
(A) Group	2	60.785	0.353	0.704
Subjects within Group	116	172.397		
Within Subjects	119			
(B) Time	1	1209.127	20.838	0.000
AB	2	87.393	1.506	0.226
B X Subject within Group	116	58.026		

Table 42

Two Way ANOVA with last factor repeated: Grade 4 Average: Nonverbal ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	118			
(A) Group	2	448.586	2.690	0.072
Subjects within Group	116	166.733		
Within Subjects	119			
(B) Time	1	1577.660	22.633	0.000
AB	2	21.562	0.309	0.735
B X Subject within Group	116	69.707		

Table 43

Two Way ANOVA with last factor repeated: Grade 4 average: Quantitative ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	117			
(A) Group	2	104.184	0.413	0.662
Subjects within Group	115	251.957		
Within Subjects	118			
(B) Time	1	548.821	6.048	0.015
AB	2	22.444	0.247	0.781
B X Subject within Group	115	90.739		

Table 44

Two Way ANOVA with last factor repeated: Grade 4 average: Reading vocabulary.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	2.571	0.580	0.562
Subjects within Group	92	4.431		
Within Subjects	190			
(B) Time	2	106.806	56.687	0.000
AB	4	2.193	1.164	0.328
B X Subject within Group	184	1.884		

Table 45

Two Way ANOVA with last factor repeated: Grade 4 average: Reading comprehension.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	3.120	0.423	0.656
Subjects within Group	92	7.379		
Within Subjects	190			
(B) Time	2	98.248	34.214	0.000
AB	4	3.555	1.238	0.296
B X Subject within Group	184	2.872		

Table 46

Two Way ANOVA with the last factor repeated: Grade 4 average: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	93			
(A) Group	2	0.958	0.313	0.732
Subjects within Group	91	3.058		
Within Subjects	188			
(B) Time	2	93.775	113.780	0.000
AB	4	0.231	0.280	0.891
B X Subject within Group	182	0.824		

Table 47

Two Way ANOVA with the last factor repeated: Grade 4 average: Math concept and application

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	93			
(A) Group	2	5.261	0.850	0.431
Subjects within Group	91	6.187		
Within Subjects	188			
(B) Time	2	108.870	72.522	0.000
AB	4	3.499	2.331	0.058
B X Subject within Group	182	1.501		

Table 48

Two Way ANOVA with the last factor repeated: Grade 4 average: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	1.854	2.709	0.072
Subjects within Group	92	0.684		
Within Subjects	190			
(B) Time	2	1.046	7.029	0.001
AB	4	0.067	0.451	0.772
B X Subject within Group	184	0.149		

Table 49

Two Way ANOVA with the last factor repeated: Grade 4 average perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	89			
(A) Group	2	2.291	3.137	0.048
Subjects within Group	87	0.730		
Within Subjects	180			
(B) Time	2	0.643	2.847	0.061
AB	4	0.140	0.620	0.648
B X Subject within Group	174	0.226		

Table 50

Two Way ANOVA with the last factor repeated: Grade 4 average: Perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	93			
(A) Group	2	1.821	2.070	0.132
Subjects within Group	91	0.880		
Within Subjects	188			
(B) Time	2	1.103	5.699	0.004
AB	4	0.062	0.320	0.864
B X Subject within Group	182	0.194		

Table 51

Two Way ANOVA with the last factor repeated: Grade 4 average: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	93			
(A) Group	2	2.251	3.322	0.041
Subjects within Group	91	0.678		
Within Subjects	188			
(B) Time	2	0.294	1.422	0.244
AB	4	0.090	0.435	0.783
B X Subject within Group	182	0.206		

Table 52

Two Way ANOVA with last factor repeated: Grade 4 average:School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	105			
(A) Group	2	3.444	0.525	0.593
Subjects within Group	103	6.564		
Within Subjects	212			
(B) Time	2	1.778	0.743	0.477
AB	4	1.074	0.449	0.773
B X Subject within Group	206	2.392		

Table 53

Two Way ANOVA with last factor repeated: Grade 4 average: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	106			
(A) Group	2	48.273	1.087	0.341
Subjects within Group	104	44.398		
Within Subjects	214			
(B) Time	2	115.771	10.002	0.000
AB	4	15.582	1.346	0.254
B X Subject within Group	208	11.575		

Table 54

Two Way ANOVA with the last factor repeated: Grade 4 average: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	99			
(A) Group	2	29.907	1.250	0.291
Subjects within Group	97	23.934		
Within Subjects	200			
(B) Time	2	148.167	13.743	0.000
AB	4	26.298	2.439	0.048
B X Subject within Group	194	10.782		

Table 55

Two Way ANOVA with last factor repeated: Grade 4 average: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	91			
(A) Group	2	203.818	5.381	0.006
Subjects within Group	89	37.877		
Within Subjects	184			
(B) Time	2	37.477	2.167	0.117
AB	4	5.586	0.323	0.862
B X Subject within Group	178	17.291		

Table 56

Two Way ANOVA with the last factor repeated: Grade 4 average: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	106			
(A) Group	2	6.224	0.947	0.391
Subjects within Group	104	6.570		
Within Subjects	214			
(B) Time	2	58.729	9.174	0.000
AB	4	6.319	0.987	0.416
B X Subject within Group	208	6.402		

Table 57

Two Way ANOVA with the last factor repeated: Grade 4 average: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	67			
(A) Group	2	0.568	1.026	0.364
Subjects within Group	65	0.554		
Within Subjects	136			
(B) Time	2	0.173	1.249	0.290
AB	4	0.193	1.388	0.242
B X Subject within Group	130	0.139		

Table 58

Two Way ANOVA with the last factor repeated: Grade 4 average: Comprehension monitoring at instructional level.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	68			
(A) Group	2	11.349	3.511	0.036
Subjects within Group	66	3.232		
Within Subjects	138			
(B) Time	2	2.518	1.657	0.195
AB	4	2.621	1.724	0.148
B X Subject within Group	132	1.520		

Table 59

Two Way ANOVA with the last factor repeated: Grade 4 average: Comprehension monitoring at frustration level.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	63			
(A) Group	2	5.054	1.866	0.164
Subjects within Group	61	2.709		
Within Subjects	128			
(B) Time	2	5.176	2.396	0.095
AB	4	1.597	0.739	0.567
B X Subject within Group	122	2.160		

Table 60

One Way ANOVA: grade 4 average: Perceived problem solving.ability

Source	DF	MS	F	P
Groups	2	36.20	0.30	0.740
Error	127	120.16		

Table 61

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Re-reading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	2.328	3.077	0.051
Subjects within Group	93	0.757		
Within Subjects	192			
(B) Time	2	10.396	17.827	0.000
AB	4	1.088	1.866	0.118
B X Subject within Group	186	0.583		

Table 62

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	1.644	4.023	0.021
Subjects within Group	93	0.409		
Within Subjects	192			
(B) Time	2	1.564	5.222	0.006
AB	4	0.096	3.660	0.007
B X Subject within Group	186	0.300		

Table 63

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	0.034	0.048	0.953
Subjects within Group	93	0.708		
Within Subjects	192			
(B) Time	2	5.561	12.464	0.000
AB	4	1.429	3.203	0.014
B X Subject within Group	186	0.446		

Table 64

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Guessing & Checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	0.781	2.750	0.069
Subjects within Group	93	0.284		
Within Subjects	192			
(B) Time	2	5.061	14.027	0.000
AB	4	1.583	4.387	0.002
B X Subject within Group	186	0.361		

Table 65

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Alternative ways to solve problem.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	0.220	1.375	0.258
Subjects within Group	93	0.160		
Within Subjects	192			
(B) Time	2	0.074	0.368	0.692
AB	4	0.143	0.711	0.585
B X Subject within Group	186	0.201		

Table 66

Two Way ANOVA with last factor repeated: Grade 4 average: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	95			
(A) Group	2	0.948	2.800	0.066
Subjects within Group	93	0.338		
Within Subjects	192			
(B) Time	2	1.778	6.220	0.002
AB	4	0.320	1.117	0.350
B X Subject within Group	186	0.286		

Table 67

Two Way ANOVA with last factor repeated: Grade 4 gifted: Verbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	113			
(A) Group	2	741.424	4.082	0.019
Subjects within Group	111	181.640		
Within Subjects	114			
(B) Time	1	3700.038	55.358	0.000
AB	2	301.056	4.504	0.013
B X Subject within Group	111	66.838		

Table 68

Two Way ANOVA with last factor repeated: Grade 4 gifted: Nonverbal ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	112			
(A) Group	2	1202.302	5.858	0.004
Subjects within Group	110	205.227		
Within Subjects	113			
(B) Time	1	5178.785	58.088	0.000
AB	2	267.828	3.004	0.054
B X Subject within Group	110	89.155		

Table 69

Two Way ANOVA with last factor repeated: Grade 4 gifted: Quantitative ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	113			
(A) Group	2	416.756	1.868	0.159
Subjects within Group	111	223.072		
Within Subjects	114			
(B) Time	1	4576.051	31.366	0.000
AB	2	178.272	1.222	0.299
B X Subject within Group	111	145.892		

Table 70

Two Way ANOVA with last factor repeated: Grade 4 gifted: Reading vocabulary

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	102			
(A) Group	2	3.035	0.472	0.625
Subjects within Group	100	6.429		
Within Subjects	206			
(B) Time	2	194.512	121.327	0.000
AB	4	1.040	0.649	0.628
B X Subject within Group	200	1.603		

Table 71

Two Way ANOVA with last factor repeated: Grade 4 gifted:Reading comprehension.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	102			
(A) Group	2	2.745	0.332	0.718
Subjects within Group	100	8.266		
Within Subjects	206			
(B) Time	2	52.474	21.858	0.000
AB	4	2.830	1.179	0.321
B X Subject within Group	200	2.401		

Table 72

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	103			
(A) Group	2	0.354	0.137	0.872
Subjects within Group	101	2.580		
Within Subjects	208			
(B) Time	2	183.798	193.127	0.000
AB	4	0.421	0.442	0.778
B X Subject within Group	202	0.952		

Table 73

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Math concept and application

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	103			
(A) Group	2	5.599	1.277	0.283
Subjects within Group	101	4.386		
Within Subjects	208			
(B) Time	2	204.908	123.915	0.000
AB	4	0.010	0.006	1.000
B X Subject within Grcup	202	1.654		

Table 74

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	0.581	1.050	0.354
Subjects within Group	92	0.554		
Within Subjects	190			
(B) Time	2	2.779	15.994	0.000
AB	4	0.144	0.827	0.509
B X Subject within Group	184	0.174		

Table 75

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	92			
(A) Group	2	0.798	1.206	0.304
Subjects within Group	90	0.662		
Within Subjects	186			
(B) Time	2	2.517	11.925	0.000
AB	4	0.077	0.366	0.832
B X Subject within Group	180	0.211		

Table 76

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	0.744	0.888	0.415
Subjects within Group	92	0.837		
Within Subjects	190			
(B) Time	2	4.159	16.331	0.000
AB	4	0.125	0.490	0.743
B X Subject within Group	184	0.255		

Table 77

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	94			
(A) Group	2	0.913	1.263	0.288
Subjects within Group	92	0.723		
Within Subjects	190			
(B) Time	2	4.688	22.996	0.000
AB	4	0.233	1.142	0.338
B X Subject within Group	184	0.204		

Table 78

Two Way ANOVA with last factor repeated: Grade 4 Gifted: School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	107			
(A) Group	2	5.900	1.020	0.364
Subjects within Group	105	5.785		
Within Subjects	216			
(B) Time	2	1.258	0.516	0.598
AB	4	0.479	0.196	0.940
B X Subject within Group	210	2.440		

Table 79

Two Way ANOVA with last factor repeated: Grade 4 Gifted: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	107			
(A) Group	2	1.520	0.038	0.962
Subjects within Group	105	39.519		
Within Subjects	216			
(B) Time	2	26.231	2.378	0.095
AB	4	3.817	0.346	0.847
B X Subject within Group	210	11.031		

Table 80

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	106			
(A) Group	2	12.651	0.604	0.548
Subjects within Group	104	20.943		
Within Subjects	214			
(B) Time	2	51.292	4.538	0.012
AB	4	14.542	1.287	0.276
B X Subject within Group	208	11.302		

Table 81

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	91.708	2.778	0.068
Subjects within Group	85	33.013		
Within Subjects	176			
(B) Time	2	38.702	3.110	0.047
AB	4	7.546	0.606	0.659
B X Subject within Group	170	12.445		

Table 82

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	100			
(A) Group	2	94.062	13.621	0.000
Subjects within Group	98	6.906		
Within Subjects	202			
(B) Time	2	40.243	5.877	0.003
AB	4	26.544	3.876	0.005
B X Subject within Group	196	6.848		

Table 83

Two Way ANOVA with the last factor repeated: Grade 4 gifted: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	100			
(A) Group	2	109.653	9.307	0.000
Subjects within Group	98	11.782		
Within Subjects	202			
(B) Time	2	1811.025	287.094	0.000
AB	4	21.915	3.474	0.009
B X Subject within Group	196	6.308		

Table 84

Two Way ANOVA with last factor repeated: Grade 4 gifted: Comprehension monitoring at instructional level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	2.947	1.240	0.295
Subjects within Group	72	2.376		
Within Subjects	150			
(B) Time	2	10.392	8.414	0.000
AB	4	2.442	1.977	0.101
B X Subject within Group	144	1.235		

Table 85

Two Way ANOVA with last factor repeated: Grade 4 gifted: Comprehension monitoring at frustration level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	75			
(A) Group	2	11.546	4.694	0.012
Subjects within Group	73	2.460		
Within Subjects	152			
(B) Time	2	35.017	23.613	0.000
AB	4	1.550	1.045	0.386
B X Subject within Group	146	1.483		

Table 86

One Way ANOVA: grade 4 gifted: Perceived problem solving ability.

Source	DF	MS	F	P
Groups	2	349.58	2.21	0.114
Error	129	158.01		

Table 87

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Rereading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	82			
(A) Group	2	1.666	1.915	0.154
Subjects within Group	80	0.870		
Within Subjects	166			
(B) Time	2	9.156	16.162	0.000
AB	4	0.300	0.529	0.714
B X Subject within Group	160	0.567		

Table 88

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	83			
(A) Group	2	0.637	1.445	0.242
Subjects within Group	81	0.441		
Within Subjects	168			
(B) Time	2	1.980	5.499	0.005
AB	4	0.150	0.417	0.797
B X Subject within Group	162	0.360		

Table 89

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	84			
(A) Group	2	0.165	0.319	0.728
Subjects within Group	82	0.518		
Within Subjects	170			
(B) Time	2	9.257	23.130	0.000
AB	4	0.794	1.984	0.099
B X Subject within Group	164	0.400		

Table 90

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Guessing & checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	82			
(A) Group	2	0.365	0.830	0.440
Subjects within Group	80	0.440		
Within Subjects	166			
(B) Time	2	3.865	11.509	0.000
AB	4	0.303	0.903	0.464
B X Subject within Group	160	0.336		

Table 91

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Alternative ways to solve problem.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	83			
(A) Group	2	0.387	1.330	0.270
Subjects within Group	81	0.291		
Within Subjects	168			
(B) Time	2	0.589	2.550	0.081
AB	4	0.564	2.443	0.049
B X Subject within Group	162	0.231		

Table 92

Two Way ANOVA with last factor repeated: Grade 4 Gifted: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	83			
(A) Group	2	0.942	1.682	0.192
Subjects within Group	81	0.560		
Within Subjects	168			
(B) Time	2	3.675	10.394	0.000
AB	4	1.406	3.976	0.004
B X Subject within Group	162	0.354		

Table 93

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Verbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	102			
(A) Group	2	339.859	4.078	0.020
Subjects within Group	100	83.330		
Within Subjects	103			
(B) Time	1	44.432	1.221	0.272
AB	2	27.120	0.745	0.477
B X Subject within Group	100	36.390		

Table 94

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Nonverbal ability.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	101			
(A) Group	2	1001.672	5.296	0.007
Subjects within Group	99	189.141		
Within Subjects	102			
(B) Time	1	62.565	0.914	0.342
AB	2	204.174	2.981	0.055
B X Subject within Group	99	68.485		

Table 95

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Quantitative ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	98			
(A) Group	2	781.978	4.734	0.011
Subjects within Group	96	165.188		
Within Subjects	99			
(B) Time	1	409.383	6.870	0.010
AB	2	69.259	1.162	0.317
B X Subject within Group	96	59.594		

Table 96

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Reading vocabulary

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	69			
(A) Group	2	21.458	2.771	0.070
Subjects within Group	67	7.744		
Within Subjects	140			
(B) Time	2	153.757	72.971	0.000
AB	4	2.988	1.418	0.231
B X Subject within Group	134	2.107		

Table 97

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Reading comprehension

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	69			
(A) Group	2	34.391	4.635	0.013
Subjects within Group	67	7.419		
Within Subjects	140			
(B) Time	2	138.424	29.868	0.000
AB	4	8.213	1.772	0.138
B X Subject within Group	134	4.635		

Table 98

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	69			
(A) Group	2	0.840	0.111	0.895
Subjects within Group	67	7.547		
Within Subjects	140			
(B) Time	2	139.063	91.524	0.000
AB	4	4.448	2.928	0.023
B X Subject within Group	134	1.519		

Table 99

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Math concept and application grade equivalent scores:

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	69			
(A) Group	2	1.329	0.157	0.855
Subjects within Group	67	8.474		
Within Subjects	140			
(B) Time	2	108.921	40.378	0.000
AB	4	9.306	3.450	0.010
B X Subject within Group	134	2.697		

Table 100

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	70			
(A) Group	2	0.738	1.522	0.226
Subjects within Group	68	0.485		
Within Subjects	142			
(B) Time	2	0.631	3.673	0.028
AB	4	0.059	0.343	0.848
B X Subject within Group	136	0.172		

Table 101

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	1.522	2.089	0.132
Subjects within Group	64	0.729		
Within Subjects	134			
(B) Time	2	0.130	0.767	0.467
AB	4	0.059	0.351	0.843
B X Subject within Group	128	0.169		

Table 102

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	67			
(A) Group	2	1.345	1.357	0.265
Subjects within Group	65	0.991		
Within Subjects	136			
(B) Time	2	0.003	0.017	0.984
AB	4	0.076	0.424	0.791
B X Subject within Group	130	0.179		

Table 103

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	67			
(A) Group	2	0.568	1.026	0.364
Subjects within Group	65	0.554		
Within Subjects	136			
(B) Time	2	0.173	1.249	0.290
AB	4	0.193	1.388	0.242
B X Subject within Group	130	0.139		

Table 104

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	78			
(A) Group	2	0.134	0.023	0..978
Subjects within Group	76	5.921		
Within Subjects	158			
(B) Time	2	3.517	1.104	0.334
AB	4	5.977	1.876	0.118
B X Subject within Group	152	3.186		

Table 105

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	79			
(A) Group	2	9.812	0.214	0.808
Subjects within Group	77	45.765		
Within Subjects	160			
(B) Time	2	107.250	9.183	0.000
AB	4	31.536	2.700	0.033
B X Subject within Group	154	11.679		

Table 106

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	29.458	1.548	0.219
Subjects within Group	79	19.025		
Within Subjects	164			
(B) Time	2	70.125	6.153	0.003
AB	4	23.674	2.077	0.086
B X Subject within Group	158	11.398		

Table 107

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	70			
(A) Group	2	89.323	2.181	0..121
Subjects within Group	68	40.951		
Within Subjects	142			
(B) Time	2	37.366	2.894	0.059
AB	4	7.723	0.598	0.664
B X Subject within Group	136	12.909		

Table 108

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	22.598	2.959	0.058
Subjects within Group	72	7.637		
Within Subjects	150			
(B) Time	2	52.991	10.704	0.000
AB	4	6.535	1.320	0.265
B X Subject within Group	144	4.950		

Table 109

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	228.075	11.782	0.000
Subjects within Group	72	19.358		
Within Subjects	150			
(B) Time	2	36.079	4.561	0.012
AB	4	26.399	3.337	0.012
B X Subject within Group	144	7.910		

Table 110

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Comprehension monitoring at instructional level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	13.931	5.296	0.007
Subjects within Group	72	2.632		
Within Subjects	150			
(B) Time	2	19.526	13.324	0.000
AB	4	2.529	1.726	0.147
B X Subject within Group	144	1.465		

Table 111

Two Way ANOVA with the last factor repeated: Grade 7 learning disabled: Comprehension monitoring at frustration level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	72			
(A) Group	2	4.541	1.575	0.214
Subjects within Group	70	2.884		
Within Subjects	146			
(B) Time	2	27.319	19.650	0.000
AB	4	2.909	2.092	0.085
B X Subject within Group	140	1.390		

Table 112

One Way ANOVA: grade 7 learning disabled: Perceived problem solving ability.

Source	DF	MS	F	P
Groups	2	266.87	2.31	0.104
Error	110	115.72		

Table 113

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Rereading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	100			
(A) Group	2	0.790	1.273	0.285
Subjects within Group	98	0.621		
Within Subjects	202			
(B) Time	2	0.680	0.992	0.373
AB	4	0.730	1.065	0.375
B X Subject within Group	196	0.686		

Table 114

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	101			
(A) Group	2	1.118	3.675	0.029
Subjects within Group	99	0.304		
Within Subjects	204			
(B) Time	2	0.407	1.001	0.370
AB	4	1.276	3.136	0.016
B X Subject within Group	198	0.407		

Table 115

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	101			
(A) Group	2	0.280	0.557	0.575
Subjects within Group	99	0.502		
Within Subjects	204			
(B) Time	2	3.699	7.911	0.000
AB	4	1.536	3.285	0.012
B X Subject within Group	198	0.468		

Table 116

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Guessing & checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	101			
(A) Group	2	0.174	0.408	0.666
Subjects within Group	99	0.425		
Within Subjects	204			
(B) Time	2	2.636	7.522	0.001
AB	4	0.231	0.660	0.620
B X Subject within Group	198	0.350		

Table 117

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Alternative ways to solve problem.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	101			
(A) Group	2	0.791	4.383	0.015
Subjects within Group	99	0.180		
Within Subjects	204			
(B) Time	2	0.167	0.900	0.408
AB	4	0.300	1.622	0.170
B X Subject within Group	198	0.185		

Table 118

Two Way ANOVA with last factor repeated: Grade 7 learning disabled: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	99			
(A) Group	2	0.825	1.823	0.167
Subjects within Group	97	0.452		
Within Subjects	200			
(B) Time	2	1.737	3.896	0.022
AB	4	1.161	2.604	0.037
B X Subject within Group	194	0.446		

Table 119

Two Way ANOVA with last factor repeated: Grade 7 average: Verbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	79			
(A) Group	2	194.653	1.989	0.144
Subjects within Group	77	97.883		
Within Subjects	80			
(B) Time	1	263.851	7.308	0.008
AB	2	17.127	0.474	0.624
B X Subject within Group	77	36.104		

Table 120

Two Way ANOVA with last factor repeated: Grade 7 average: Nonverbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	79			
(A) Group	2	930.036	6.205	0.003
Subjects within Group	77	149.896		
Within Subjects	80			
(B) Time	1	655.573	11.886	0.001
AB	2	22.002	0.399	0.672
B X Subject within Group	77	55.156		

Table 121

Two Way ANOVA with last factor repeated: Grade 7 average: Quantitative ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	505.557	2.933	0.060
Subjects within Group	72	172.389		
Within Subjects	75			
(B) Time	1	1348.310	21.684	0.000
AB	2	203.523	3.273	0.044
B X Subject within Group	72	62.181		

Table 122

Two Way ANOVA with the last factor repeated: Grade 7 average: Reading vocabulary

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	50			
(A) Group	2	10.542	1.261	0.293
Subjects within Group	48	8.360		
Within Subjects	102			
(B) Time	2	87.946	22.492	0.000
AB	4	1.655	0.423	0.792
B X Subject within Group	96	3.910		

Table 123

Two Way ANOVA with the last factor repeated: Grade 7 average: Reading comprehension

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	50			
(A) Group	2	5.542	1.035	0.363
Subjects within Group	48	5.354		
Within Subjects	102			
(B) Time	2	119.039	72.050	0.000
AB	4	0.768	0.465	0.761
B X Subject within Group	96	1.652		

Table 124

Two Way ANOVA with the last factor repeated: Grade 7 average: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	50			
(A) Group	2	0.266	0.046	0.955
Subjects within Group	48	5.763		
Within Subjects	102			
(B) Time	2	114.760	75.123	0.000
AB	4	3.078	2.015	0.098
B X Subject within Group	96	1.528		

Table 125

Two Way ANOVA with the last factor repeated: Grade 7 average: Math concept and application

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	50			
(A) Group	2	0.616	0.108	0.898
Subjects within Group	48	5.702		
Within Subjects	102			
(B) Time	2	83.471	34.061	0.000
AB	4	0.708	0.289	0.885
B X Subject within Group	96	2.451		

Table 126

Two Way ANOVA with the last factor repeated: Grade 7 average: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	59			
(A) Group	2	0.539	0.985	0.380
Subjects within Group	57	0.548		
Within Subjects	120			
(B) Time	2	0.117	1.131	0.326
AB	4	0.043	0.411	0.800
B X Subject within Group	114	0.103		

Table 127

Two Way ANOVA with the last factor repeated: Grade 7 average: Perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	57			
(A) Group	2	1.191	1.563	0.219
Subjects within Group	55	0.762		
Within Subjects	116			
(B) Time	2	0.570	4.664	0.011
AB	4	0.245	2.003	0.099
B X Subject within Group	110	0.122		

Table 128

Two Way ANOVA with the last factor repeated: Grade 7 average: Perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	59			
(A) Group	2	0.178	0.189	0.828
Subjects within Group	57	0.942		
Within Subjects	120			
(B) Time	2	0.154	1.309	0.274
AB	4	0.044	0.375	0.826
B X Subject within Group	114	0.118		

Table 129

Two Way ANOVA with last factor repeated: Grade 7 average: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	55			
(A) Group	2	0.380	0.591	0.557
Subjects within Group	53	0.643		
Within Subjects	112			
(B) Time	2	0.639	4.057	0.020
AB	4	0.230	1.461	0.219
B X Subject within Group	106	0.157		

Table 130

Two Way ANOVA with the last factor repeated: Grade 7 average: School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	54			
(A) Group	2	1.625	0.368	0.694
Subjects within Group	52	4.414		
Within Subjects	110			
(B) Time	2	0.263	0.107	0.899
AB	4	3.174	1.290	0.279
B X Subject within Group	104	2.460		

Table 131

Two Way ANOVA with the last factor repeated: Grade 7 average: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	54			
(A) Group	2	19.302	0.561	0.574
Subjects within Group	52	34.412		
Within Subjects	110			
(B) Time	2	40.575	3.220	0.044
AB	4	22.201	1.762	0.142
B X Subject within Group	104	12.602		

Table 132

Two Way ANOVA with the last factor repeated: Grade 7 average: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	7.008	0.587	0.559
Subjects within Group	60	11.948		
Within Subjects	126			
(B) Time	2	11.283	1.201	0.304
AB	4	13.771	1.466	0.217
B X Subject within Group	120	9.393		

Table 133

Two way ANOVA with last factor repeated: Grade 7 average: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	46.324	1.518	0.227
Subjects within Group	64	30.515		
Within Subjects	134			
(B) Time	2	21.941	1.965	0.144
AB	4	26.045	2.333	0.059
B X Subject within Group	128	11.166		

Table 134

Two Way ANOVA with the last factor repeated: Grade 7 average: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	19.797	2.522	0.087
Subjects within Group	72	7.849		
Within Subjects	150			
(B) Time	2	48.067	9.583	0.000
AB	4	8.085	1.612	0.174
B X Subject within Group	144	5.016		

Table 135

Two Way ANOVA with the last factor repeated: Grade 7 average: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	178.205	9.270	0.000
Subjects within Group	72	19.224		
Within Subjects	150			
(B) Time	2	39.539	4.754	0.010
AB	4	38.944	4.683	0.001
B X Subject within Group	144	8.317		

Table 136

Two Way ANOVA with the last factor repeated: Grade 7 average: Comprehension monitoring at instructional level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	69			
(A) Group	2	2.632	1.009	0.370
Subjects within Group	67	2.609		
Within Subjects	140			
(B) Time	2	64.617	45.183	0.000
AB	4	1.539	1.076	0.371
B X Subject within Group	134	1.430		

Table 137

Two Way ANOVA with the last factor repeated: Grade 7 average: Comprehension monitoring at frustration level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	67			
(A) Group	2	8.657	2.698	0.075
Subjects within Group	65	3.208		
Within Subjects	136			
(B) Time	2	9.379	5.791	0.004
AB	4	0.551	0.340	0.851
B X Subject within Group	130	1.620		

Table 138

One Way ANOVA: grade 7 average: Perceived problem solving ability.

Source	DF	MS	F	P
Groups	2	213.58	1.53	0.221
Error	98	139.39		

Table 139

Two Way ANOVA with last factor repeated: Grade 7 average: Math problem solving strategy: Rereading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	1.271	1.816	0.169
Subjects within Group	79	0.700		
Within Subjects	164			
(B) Time	2	2.231	3.311	0.039
AB	4	0.697	1.034	0.391
B X Subject within Group	158	0.674		

Table 140

Two Way ANOVA with last factor repeate: Grade 7 average: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	80			
(A) Group	2	1.109	2.201	0.117
Subjects within Group	78	0.504		
Within Subjects	162			
(B) Time	2	0.296	0.637	0.530
AB	4	0.468	1.008	0.405
B X Subject within Group	156	0.464		

Table 141

Two Way ANOVA with last factor repeated: Grade 7 average: Math problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	0.346	0.809	0.449
Subjects within Group	79	0.427		
Within Subjects	164			
(B) Time	2	3.436	7.943	0.001
AB	4	0.656	1.518	0.200
B X Subject within Group	158	0.433		

Table 142

Two Way ANOVA with last factor repeated: Grade 7 average: Math problem solving strategy: Guessing & Checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	0.056	0.174	0.841
Subjects within Group	79	0.321		
Within Subjects	164			
(B) Time	2	1.122	2.862	0.060
AB	4	0.361	0.921	0.453
B X Subject within Group	158	0.392		

Table 143

Two Way ANOVA with last factor repeated: Grade 7 average: Math problem solving strategy: Alternative ways to solve problems.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	0.506	1.719	0.186
Subjects within Group	79	0.294		
Within Subjects	164			
(B) Time	2	0.483	1.797	0.169
AB	4	0.136	0.505	0.732
B X Subject within Group	158	0.269		

Table 144

Two Way ANOVA with last factor repeated: Grade 7 average: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	0.803	1.489	0.232
Subjects within Group	79	0.539		
Within Subjects	164			
(B) Time	2	1.513	3.428	0.035
AB	4	3.132	7.096	0.000
B X Subject within Group	158	0.441		

Table 145

Two Way ANOVA with last factor repeated: Grade 7 gifted: Verbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	77			
(A) Group	2	100.951	0.731	0.485
Subjects within Group	75	138.053		
Within Subjects	78			
(B) Time	1	6.309	0.138	0.711
AB	2	227.929	4.994	0.009
B X Subject within Group	75	45.640		

Table 146

Two Way ANOVA with last factor repeated: Grade 7 gifted: Nonverbal ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	76			
(A) Group	2	1247.371	5.730	0.005
Subjects within Group	74	217.676		
Within Subjects	77			
(B) Time	1	112.615	1.537	0.219
AB	2	245.564	3.351	0.040
B X Subject within Group	74	73.284		

Table 147

Two Way ANOVA with last factor repeated: Grade 7 gifted: Quantitative ability

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	74			
(A) Group	2	1064.942	5.268	0.007
Subjects within Group	72	202.139		
Within Subjects	75			
(B) Time	1	394.650	5.789	0.019
AB	2	185.040	2.715	0.073
B X Subject within Group	72	68.167		

Table 148

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Reading vocabulary

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	63			
(A) Group	2	1.043	0.288	0.751
Subjects within Group	61	3.624		
Within Subjects	128			
(B) Time	2	88.683	89.149	0.000
AB	4	0.371	0.373	0.828
B X Subject within Group	122	0.995		

Table 149

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Reading comprehension

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	63			
(A) Group	2	2.292	0.625	0.538
Subjects within Group	61	3.665		
Within Subjects	128			
(B) Time	2	2.342	1.723	0.183
AB	4	1.659	1.221	0.306
B X Subject within Group	122	1.359		

Table 150

Two Way ANOVA with last factor repeated: Grade 7 gifted: Math computation

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	63			
(A) Group	2	1.947	0.349	0.707
Subjects within Group	61	5.578		
Within Subjects	128			
(B) Time	2	195.920	190.320	0.000
AB	4	4.893	4.753	0.001
B X Subject within Group	122	1.029		

Table 151

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Math concept and application

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	63			
(A) Group	2	2.459	0.617	0.543
Subjects within Group	61	3.989		
Within Subjects	128			
(B) Time	2	54.441	49.306	0.000
AB	4	2.386	2.161	0.077
B X Subject within Group	122	1.104		

Table 152

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Perceived competence (cognitive).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	0.077	0.174	0.841
Subjects within Group	64	0.441		
Within Subjects	134			
(B) Time	2	0.081	0.933	0.396
AB	4	0.062	0.711	0.586
B X Subject within Group	128	0.087		

Table 153

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Perceived competence (social).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	65			
(A) Group	2	0.516	0.844	0.435
Subjects within Group	63	0.612		
Within Subjects	132			
(B) Time	2	0.170	1.126	0.327
AB	4	0.140	0.933	0.447
B X Subject within Group	126	0.151		

Table 154

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Perceived competence (physical).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	0.268	0.253	0.777
Subjects within Group	64	1.060		
Within Subjects	134			
(B) Time	2	0.044	0.321	0.726
AB	4	0.102	0.736	0.569
B X Subject within Group	128	0.138		

Table 155

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Perceived competence (general).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	66			
(A) Group	2	0.498	0.970	0.385
Subjects within Group	64	0.513		
Within Subjects	134			
(B) Time	2	0.015	0.113	0.893
AB	4	0.447	3.310	0.013
B X Subject within Group	128	0.135		

Table 156

Two Way ANOVA with the last factor repeated: Grade 7 gifted: School self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	0.870	0.207	0.813
Subjects within Group	60	4.200		
Within Subjects	126			
(B) Time	2	5.603	2.257	0.109
AB	4	5.943	2.394	0.054
B X Subject within Group	120	2.482		

Table 157

Two Way ANOVA with the last factor repeated: Grade 7 gifted: General self concept.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	62			
(A) Group	2	15.012	0.280	0.757
Subjects within Group	60	53.705		
Within Subjects	126			
(B) Time	2	34.430	1.110	0.333
AB	4	24.607	0.794	0.532
B X Subject within Group	120	31.009		

Table 158

Two Way ANOVA with last factor repeated: Grade 7 gifted: Internal locus of control.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	72			
(A) Group	2	29.233	1.383	0.258
Subjects within Group	70	21.135		
Within Subjects	146			
(B) Time	2	44.880	4.590	0.012
AB	4	9.029	0.923	0.452
B X Subject within Group	140	9.777		

Table 159

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Metacognitive reading awareness.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	65			
(A) Group	2	190.644	8.476	0.001
Subjects within Group	63	22.492		
Within Subjects	132			
(B) Time	2	33.413	4.998	0.008
AB	4	3.737	0.559	0.693
B X Subject within Group	126	6.686		

Table 160

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Cloze (synonyms).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	82			
(A) Group	2	2.931	0.377	0.687
Subjects within Group	80	7.780		
Within Subjects	166			
(B) Time	2	251.279	30.262	0.000
AB	4	74.048	8.918	0.000
B X Subject within Group	160	8.303		

Table 161

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Cloze (correct).

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	81			
(A) Group	2	200.177	16.097	0.000
Subjects within Group	79	12.436		
Within Subjects	164			
(B) Time	2	494.111	57.969	0.000
AB	4	106.174	12.456	0.000
B X Subject within Group	158	8.524		

Table 162

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Comprehension monitoring at instructional level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	68			
(A) Group	2	6.412	2.568	0.084
Subjects within Group	66	2.497		
Within Subjects	138			
(B) Time	2	6.373	4.377	0.014
AB	4	5.647	3.878	0.005
B X Subject within Group	132	1.456		

Table 163

Two Way ANOVA with the last factor repeated: Grade 7 gifted: Comprehension monitoring at frustration level

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	68			
(A) Group	2	13.905	3.878	0.026
Subjects within Group	66	3.585		
Within Subjects	138			
(B) Time	2	41.001	22.218	0.000
AB	4	7.451	4.038	0.004
B X Subject within Group	132	1.845		

Table 164

One Way ANOVA: grade 7 gifted: Perceived problem solving ability.

Source	DF	MS	F	P
Groups	2	305.21	1.94	0.149
Error	97	157.35		

Table 165

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Math problem solving strategy: Rereading.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	0.254	0.349	0.707
Subjects within Group	85	0.728		
Within Subjects	176			
(B) Time	2	2.040	3.190	0.044
AB	4	4.691	7.335	0.000
B X Subject within Group	170	0.639		

Table 166

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Math problem solving strategy: Stating plans.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	0.166	0.356	0.702
Subjects within Group	85	0.468		
Within Subjects	176			
(B) Time	2	0.250	0.626	0.536
AB	4	1.486	3.716	0.006
B X Subject within Group	170	0.400		

Table 167

Two Way ANOVA with last factor repeate: Grade 7 Gifted: Math Problem solving strategy: Manipulatives.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	0.260	0.496	0.611
Subjects within Group	85	0.525		
Within Subjects	176			
(B) Time	2	6.473	15.671	0.000
AB	4	1.233	2.984	0.021
B X Subject within Group	170	0.413		

Table 168

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Math problem solving strategy: Guessing & checking.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	0.264	0.667	0.516
Subjects within Group	85	0.396		
Within Subjects	176			
(B) Time	2	0.036	0.119	0.888
AB	4	0.253	0.835	0.505
B X Subject within Group	170	0.303		

Table 169

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Math Problem solving strategy: Alternative ways to solve problem.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	0.499	2.157	0.122
Subjects within Group	85	0.231		
Within Subjects	176			
(B) Time	2	1.396	5.722	0.004
AB	4	0.374	1.532	0.195
B X Subject within Group	170	0.244		

Table 170

Two Way ANOVA with last factor repeated: Grade 7 Gifted: Math problem solving strategy: Checking reasonableness of answer.

Source of Variation	D.F.	Mean Squares	F Ratio	Prob.
Between Subjects	87			
(A) Group	2	1.182	2.262	0.110
Subjects within Group	85	0.523		
Within Subjects	176			
(B) Time	2	6.243	11.720	0.000
AB	4	2.517	4.725	0.001
B X Subject within Group	170	0.533		

APPENDIX G

Teachers' Perceptions of the Cognitive Education Project

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Teachers' Questionnaire Results

Question : I found the Cognitive Education Project team generally supportive.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	13	24	0	1	0	38
	SPELT	13	22	0	0	0	35
	Control	items not relevant					
Gr. 5	IE	2	8	1	0	0	11
	SPELT	8	5	1	0	0	14
	Control	items not relevant					
Gr. 7	IE	11	17	5	2	0	35
	SPELT	4	2	0	0	0	6
	Control	item not relevant					
Gr. 8	IE	3	4	0	0	0	7
	SPELT	1	1	0	0	0	2
	Control	item not relevant					

Question : My consultations with the project team led generally to a satisfactory resolution of issues/problems.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	9	24	2	0	2	37
	SPELT	8	24	1	0	0	33
	Control	items not relevant					
Gr. 5	IE	3	7	1	0	0	11
	SPELT	5	5	2	0	0	12
	Control	items not relevant					
Gr. 7	IE	4	19	4	6	0	33
	SPELT	2	4	0	0	0	6
	Control	items not relevant					
Gr. 8	IE	2	4	1	0	0	7
	SPELT	0	1	1	0	0	2
	Control	items not relevant					

Question : I received clear instructions from the project team on the administration of group tests.

		Strongly Agree 1	2	3	4	Strongly Disagree 5	N
Gr. 4	IE	13	20	4	2	3	42
	SPELT	10	13	2	6	4	35
	Control	4	11	4	5	1	25
Gr. 5	IE	4	7	0	0	0	11
	SPELT	2	6	0	0	1	9
	Control	1	0	0	0	1	2
Gr. 7	IE	8	15	4	7	0	34
	SPELT	0	5	0	0	0	5
	Control	0	11	2	0	0	13
Gr. 8	IE	2	4	0	0	0	6
	SPELT	0	1	0	0	1	2
	Control	0	3	0	1	3	7

Question : Did you have any concerns with being asked to administer group tests to your students.

		Yes	N	% Yes
Gr. 4	IE	16	41	39
	SPELT	19	34	56
	Control	11	26	42
Gr. 5	IE	3	11	27
	SPELT	4	12	33
	Control	2	5	40
Gr. 7	IE	19	35	54
	SPELT	0	5	0
	Control	7	13	54
Gr. 8	IE	1	6	17
	SPELT	0	2	0
	Control	3	6	50

Question : Results of the group achievement test (CAT) administered to my students were made available to me.

		Strongly Agree 1	2	3	4	Strongly Disagree 5	N
Gr. 4	IE	29	9	0	0	2	40
	SPELT	14	18	0	1	0	33
	Control	13	13	0	0	0	26

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 5	IE	4	5	0	0	0	9
	SPELT	3	7	0	0	1	11
	Control	2	1	1	0	1	5
Gr. 7	IE	18	14	2	0	1	35
	SPELT	4	0	0	0	0	4
	Control	6	4	0	0	0	10
Gr. 8	IE	1	2	1	0	1	5
	SPELT	0	1	0	0	1	2
	Control	1	4	1	0	2	8

Question : The information from the CAT results was useful to me as a teacher.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	17	19	3	0	2	41
	SPELT	13	11	9	1	1	35
	Control	4	18	2	0	0	24
Gr. 5	IE	1	8	2	0	0	11
	SPELT	2	8	0	0	0	10
	Control	1	2	1	0	0	4
Gr. 7	IE	4	13	13	2	0	32
	SPELT	2	2	2	0	0	6
	Control	2	10	0	0	0	12
Gr. 8	IE	0	4	1	0	1	6
	SPELT	0	1	1	0	0	2
	Control	0	6	0	1	0	7

Question : I found the inservice training to be adequate in preparing me to implement instrumental Enrichment/Spelt procedures in my class.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	2	33	6	0	0	41
	SPELT	5	20	6	2	0	33
Gr. 5	IE	7	4	0	1	0	12
	SPELT	4	6	2	1	0	13
Gr. 7	IE	11	21	2	1	0	35
	SPELT	4	1	2	0	0	7

		Strongly Agree			Strongly Disagree		N
		1	2	3	4	5	
Gr. 8	IE	2	4	0	0	0	6
	SPELT	0	1	1	0	0	2

Question : I felt reasonably competent beginning instruction in Instrumental Enrichment/Spelt after the inservice training.

		Strongly Agree			Strongly Disagree		N
		1	2	3	4	5	
Gr. 4	IE	6	29	8	0	0	43
	SPELT	6	19	4	2	1	32
Gr. 5	IE	4	6	0	0	0	10
	SPELT	2	6	2	1	0	11
Gr. 7	IE	6	23	4	3	0	36
	SPELT	1	4	1	0	0	6
Gr. 8	IE	2	5	0	0	0	7
	SPELT	0	1	1	0	0	2

Question : Were the follow-up visits helpful to you in carrying out the experimental procedures?

		Very Helpful	Helpful	Slightly Helpful	Not Helpful	N
Gr. 4	IE	18	13	1	1	33
	SPELT	7	14	7	2	30
Gr. 5	IE	3	4	1	2	10
	SPELT	2	7	2	0	11

		Very Helpful	Helpful	Slightly Helpful	Not Helpful	N
Gr. 7	IE	8	16	5	3	32
	SPELT	1	3	1	0	5
Gr. 8	IE	2	4	0	0	6
	SPELT	0	1	1	0	2

Question : Did you find the three 40-minute periods per week allotted for instruction in Instrumental Enrichment/Spelt adequate?

		Yes	N	% Yes
Gr. 4	IE	32	39	82
	SPELT	20	30	67

Gr. 5	IE	3	9	33
	SPELT	7	11	64
Gr. 7	IE	22	35	63
	SPELT	4	6	67
Gr. 8	IE	4	7	57
	SPELT	1	2	50

Question : Did you find the Instrumental Enrichment/Spelt procedures suitable for group instruction given the number of students in your class?

		Yes	N	% Yes
Gr. 4	IE	33	41	80
	SPELT	30	34	88
Gr. 5	IE	5	10	50
	SPELT	10	12	83
Gr. 7	IE	29	35	83
	SPELT	5	5	100
Gr. 8	IE	5	7	71
	SPELT	1	2	50

Question : Have you observed any positive changes in your students in the following areas:

(a) academic performance
(b) self-image and pride in performance
(c) eagerness to work (study)
(d) attention span/time on task
(e) ability/readiness to cope with more difficult tasks
(f) tendency to ask questions

		a	b	c	d	e	f	N
Gr. 4	IE	29	31	30	34	34	32	40
	SPELT	25	24	28	17	24	26	31
	Control	14	16	12	16	16	10	18
Gr. 5	IE	4	7	4	6	8	9	11
	SPELT	5	7	5	7	9	8	12
	Control	2	2	1	1	1	0	3
Gr. 7	IE	18	24	12	26	25	27	33
	SPELT	6	3	1	3	2	5	8
	Control	6	6	4	4	4	4	12
Gr. 8	IE	6	6	5	5	5	6	7
	SPELT	1	0	1	1	1	1	2
	Control	1	2	2	0	2	3	5

Question : Did you develop procedures to ensure that students would use the strategies acquired through the Instrumental Enrichment/Spelt program in other subjects and/or classrooms?

		Yes	N	% Yes
Gr. 4	IE	34	39	87
	SPELT	25	33	76
Gr. 5	IE	9	11	82
	SPELT	9	9	100
Gr. 7	IE	33	33	100
	SPELT	4	6	67
Gr. 8	IE	6	7	86
	SPELT	1	2	50

Question : Did you find that students were using strategies learned in the Instrumental Enrichment/Spelt program in other subjects and/or classrooms?

		Yes	N	% Yes
Gr. 4	IE	33	37	89
	SPELT	29	31	94
Gr. 5	IE	7	9	78
	SPELT	8	8	100
Gr. 7	IE	20	25	80
	SPELT	3	4	75
Gr. 8	IE	6	7	86
	SPELT	0	2	0

Question : Have you received any questions from parents regarding what this experimental program is all about?

		Yes	N	% Yes
Gr. 4	IE	25	41	61
	SPELT	18	32	56
Gr. 5	IE	4	11	36
	SPELT	4	13	31
Gr. 7	IE	12	31	39
	SPELT	1	6	17
Gr. 8	IE	4	7	57
	SPELT	0	2	0

Question : Have you received any comments or questions from parents that seem to suggest that they have noticed changes in their child's behaviour, attitude to school work, etc., since the beginning of this experimental program?

		Yes	N	% Yes
Gr. 4	IE	6	38	16
	SPELT	12	33	36
Gr. 5	IE	2	11	18
	SPELT	3	11	27
Gr. 7	IE	9	29	31
	SPELT	2	7	29
Gr. 8	IE	3	7	43
	SPELT	1	2	50

Question : Participation in the Cognitive Education Project has enhanced my professional development.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	20	17	0	2	0	39
	SPELT	10	23	0	0	0	33
Gr. 5	IE	7	4	0	0	0	11
	SPELT	4	8	0	0	0	12
Gr. 7	IE	13	22	0	0	0	35
	SPELT	3	3	0	0	0	6

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 8	IE	5	2	0	0	0	7
	SPELT	0	1	1	0	0	2

Question : I would continue to use the I.E./Spelt procedures in my class even after my involvement with this project.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	16	20	3	0	0	39
	SPELT	3	5	0	0	0	8
GR. 5	IE	4	7	0	0	0	11
	SPELT	5	6	0	0	0	11
Gr. 7	IE	15	11	9	0	0	35
	SPELT	3	3	0	0	0	6
Gr. 8	IE	3	2	1	0	0	6
	SPELT	1	1	0	0	0	2

Question :I would recommend the program to other teachers.

		Strongly Agree				Strongly Disagree	N
		1	2	3	4	5	
Gr. 4	IE	22	18	0	0	0	40
	SPELT	10	20	2	0	0	32
Gr. 5	IE	5	6	0	0	0	11
	SPELT	5	6	0	0	0	11
Gr. 7	IE	15	14	6	0	0	35
	SPELT	3	3	0	0	0	6
Gr. 8	IE	3	3	0	0	0	6
	SPELT	1	1	0	0	0	2

Question : Have you taught any strategies to your students in the course of the year?

	Yes	N	% Yes
Control	6	24	25
Control	1	2	50
Control	8	12	67
Control	2	5	40

Follow up Teacher Questionnaire
1988/89

1. Are you teaching the program in its entirety to your present class?

		Yes	N	% Yes
Elem.	IE	0	11	0
	SPELT	2	19	11
J.H.	IE	0	9	0
	SPELT	1	3	33

2. Are you teaching certain aspects of the program to your present class?

		Yes	N	% Yes
Elem.	IE	9	11	82
	SPELT	16	17	94
J.H.	IE	5	9	56
	SPELT	3	3	100

3. Given the opportunity (i.e., time, materials, etc.), would you choose to teach the program in its entirety to your class?

		Yes	N	% Yes
Elem.	IE	7	11	64
	SPELT	10	19	53
J.H.	IE	5	8	63
	SPELT	2	3	67

4. Having gone through the inservice training and implementation would you recommend this program approach to your colleagues?

		Yes	N	% Yes
Elem.	IE	10	11	91
	SPELT	19	20	95
J.H.	IE	9	9	100
	SPELT	3	3	100

5. What type of student do you feel this program is best suited for?

		All Ability Levels	All Grade Levels	Ave.	Below Ave.	Above Avg.	Above Gr.4
Elem.	IE	3	1	5	5	3	2
	SPELT	7		6	3	6	
J.H.	IE	1		2	7	2	
	SPELT	2			1	2	

APPENDIX H

Principals' Perceptions of the Cognitive Education Project

Principals' Questionnaire Results

An eleven item questionnaire regarding the principal's perception of both the implementation of the experimental programs and participation in the Cognitive Education Project in general, was distributed to all principals in May of 1985, 1986 and 1987.

Results: Principals in the I.E. Condition

Question #1 "Did your teacher(s) brief you about the program upon return from inservicing sessions?"

There was a 100% yes response to this question during all three years. All teachers had informed principals of their perceptions of the program and implementation.

Question #2 This question asked principals to rate his/her teachers enthusiasm immediately after inservice on a scale of 1 to 5 with 1 representing the lowest, and five the highest, level of enthusiasm.

Out of a total of 30 teachers, involved in the first year, 13 were rated 5 (the highest level), 9 were rated 4, 1 was rated 3, 4 were rated 2, and 3 were rated 1. The mean rating was 4. This was a very high mean rating overall with respect to enthusiasm. During the second year of the study, it was determined that 11 of the 23 teachers were rated at the highest level, 5, 9 were rated 4 and 3 were rated 3. During year 3 of the study 5 of the 9 teachers were rated 5, 3 were rated 4 and 1 was rated 3 with respect to degree of enthusiasm.

Question #3 This question asked principals to rate the teachers' change in enthusiasm as a result of the project, at the end of the first, second and third year.

During year 1, 11 of the 30 teachers were rated as showing an increase in enthusiasm as the project proceeded, 11 were rated as having no change in enthusiasm and 8 were rated as decreasing in enthusiasm. The above is somewhat surprising considering that 13 out of 30 were given the highest ranking in enthusiasm and 11 were indicated as increasing in enthusiasm. It is evident that over the course of the first year of the project, principals generally appeared to perceive a high degree of enthusiasm on the part of the majority of the teachers. During Year 2, 15 of the 23 teachers were rated as showing no change in enthusiasm, 6 were rated as showing an increase in enthusiasm and 2 were rated as demonstrating a decrease in enthusiasm over the course of the second year. During Year 3, 4 of the 9 teachers were rated as showing no change in enthusiasm, 2 as increasing in enthusiasm over the course of the third year.

Question #4 This question asked if they, as principals, had any concerns regarding the administration of group tests by their teacher(s).

Year 1 - 14 principals indicated no and 3 indicated yes. Of the 3 indicating concern 1 was concerned with items asked on the Self-Concept measure and 1 indicated concern about time taken out of class for this.

Year 2 - Only 1 of the 16 principals indicated that they had concerns regarding the administration of group tests by their teachers. This concern arose because the testing was time consuming and it was difficult to find space to conduct the tests.

Year 3 - 1 principal indicated having concerns regarding the group testing, however, he/she did not list what the particular concerns were.

Question #6 This question asked principals whether other staff had requested inservicing from the experimental teachers.

In Year 1, 5 principals gave a yes response and 11 indicated no. In Year 2, only 3 principals indicated that inservices were requested. The remaining 13 principals indicated no for this question. In Year 3, 1 principal indicated that staff had requested inservices, while the remaining 3 principals answered no to this question.

Question #7 This question asked if the project created any administrative problems for principals.

In Year 1, 12 of the 16 respondents indicated that it had not, and 4 said it had produced some administrative difficulties. One Principal indicated that it had provided timetabling difficulties at the Junior High level, and another Principal indicated that the teacher being out of class, for a significant amount of time, produced a problem. Other concerns included, keeping the class together for two years, and finding a teacher to follow up during the second year of the study. In Year 2 only 3 respondents indicated that the I.E. program created administrative problems for them. These included timetabling difficulties, transition to grade 5 and 8 and concerns regarding taking time out of curriculum for I.E. instruction. In Year 3, 2 of the responding 4 principals indicated that administrative problems in timetable scheduling resulted from their involvement in this project.

Question #9 This question asked whether principals found the project team to be supportive in the project.

This was rated on a scale of 1 to 5 with 1 indicating strongly agree and 5 indicating strongly disagree. In Year 1, 5 principals indicated strongly agree, 10 principals indicated agree and 2 principals indicated uncertain. During Year 2, 3 principals indicated strongly agree, 6 principals indicated agree and 5 principals indicated uncertain. During Year 3, 3 principals indicated agree and 1 principal indicated uncertain.

Question #10 This question asked principals whether consultations with the project team generally resulted in a satisfactory resolution of problems.

They responded on a five-point scale ranging from strongly agree to strongly disagree. In Year 1, 5 principals indicated strongly agree, 11 principals indicated agree, and 1 principal indicated uncertain. During Year 2, 1 principal indicated strongly agree, 7 principals indicated agree, and 3 principals indicated uncertain. During Year 3, only 3 principals responded to this question and they all indicated agree. Additional, Year 1 comments written by principals in the I.E. condition were:

a. Entire staff inserviced by I.E. teacher enthusiasm carried over to entire staff.
b. Some frustration by teacher to find time in curriculum for teaching.
c. Questionnaire at this time of year unpopular.
d. Communication from School District Central Office to schools or project office to schools or Central Office not always same.
e. I would like to continue program, however, timetabling is difficult.

Year 2 comments included:

a. Individual assessments should be conducted prior to June 16.
b. Students in our school did not put forth the expected effort towards the I.E. program.

Results: Principals in the SPELT Condition

Question #1 "Did the teacher(s) involved in the project at your school brief you about the details of the experimental program after inservice training?"

During Year 1, all 6 respondents indicated that the teachers had briefed them regarding further details of the project. During the second year however, only 2 of the 11 respondents indicated that their teachers had briefed them concerning the details of the SPELT program. During Year 3, all 8 of the respondents indicated that their teachers had briefed them with regards to the SPELT program.

Question #2 "On a scale of 1 to 5 with 1 representing the lowest and 5 the highest level, how would you rate the enthusiasm of your teacher(s) in the program immediately after inservice?"

In Year 1, of the 9 teachers rated, 1 was rated 3, 3 were rated 4 and 5 were rated 5. The mean rating was 4. During Year 2, the enthusiasm of 18 teachers was rated as follows: 1 teacher was rated 2, 3 were rated 3, 12 were rated 4 and 2 were rated 5. During Year 3, 1 teacher was rated 1, 1 was rated 2, 4 were rated 3, 9 were rated 4 and 3 were rated 5.

Question #3 "Over the course of the program did you observe any change in your teachers' enthusiasm that you feel would be related to the project?"

In Year 1, of the 9 teachers, 3 were seen as increasing in enthusiasm, 5 were seen as evidencing no change and 1 was viewed to have decreased in enthusiasm. During Year 2, respondents felt that 10 of their teachers had demonstrated an increase in enthusiasm over the course of the year, 5 demonstrated no change and 3 demonstrated a decrease in enthusiasm. In Year 3, principals indicated that 6 of the teachers evidenced no change in enthusiasm, 11 increased with respect to enthusiasm and 1 decreased.

Questions #4 & 5 "Did you have any concerns with the administration of group tests by your teachers on behalf of the project team? If your answer to the last question was "Yes," please list these concerns. "

In Year 1, 4 principals indicated no concern. Two indicated some concern regarding the personal nature of the affective measures. In Year 2, 6 of the 11 respondents indicated concerns regarding the amount of time required for testing, problems with testing only a few children in each class, the type of questions upset some parents and children, and the testing schedule (i.e.., May and June). During Year 3, 2 of the 8 principals indicated that they had concerns regarding the administration of the group tests. In particular the length of time required to conduct the tests and the time between testing periods were seen as causing administrative problems.

Question #6 "Have other teachers on your staff requested inservicing from participating teachers?"

During year 1, 4 principals responded no to this question and 1 responded yes. During Year 2, 4 of the 11 principals indicated that other teachers had requested inservicing by the participating teachers. In Year 3, 3 of the 10 respondents indicated that teachers had requested inservicing.

Question #7 "Did your school's participation in this project create any administrative problems for you?"

During Year 1, 6 principals responded no to this question. During Year 2, 1 of the 11 principals indicated that participation in the Cognitive Education project had created administrative problems. This was a result of the participating teacher being only part-time. During Year 3, all 9 respondents indicated that no administrative problems occurred as a result of participating in the project.

Question #9 "I personally found the project team from the University of Alberta generally supportive".

In Year 1, 1 principal indicated a strongly agree, and 4 indicated agreement. During Year 2, 2 principals indicated that they strongly agreed with the above statement, 7 indicated agreement, 1 indicated uncertainty and 1 disagreement. During Year 3, 1 principal disagreed that the project team was supportive. Four agreed with the statement and the remaining 5 strongly agreed.

Question #10 "My consultations with the project team led generally to a satisfactory resolution of problems encountered."

In Year 1, 4 responded in agreement and 3 did not check off this item (1 indicated no problems had arisen therefore no need to respond).

Additional comments written by principals in the SPELT condition were:

a.. Project has generated considerable interest among our entire staff.

During Year 2, 5 respondents indicated agreement with this question and 3 uncertainty. During Year 3, 1 respondent disagreed with this statement, 6 agreed and 3 strongly agreed. One school requested full school inservicing.

b. Our school has derived a definite benefit from being involved in the Cognitive Education Project. Learning strategies is vital.

c. I am concerned about the small amount of communication between my school and the project staff regarding the SPELT program in particular.

Results : Principals in Control Condition

Question #1 During Year 1, 5 principals indicated that their teachers had briefed them concerning the details of the project. During Year 2, 4 of the 9 teachers indicated that their teachers had briefed them concerning the Cognitive Education Project. During Year 3, both of the responding principals indicated that their teachers had briefed them regarding their involvement in the project.

Question #3 During Year 1, 4 principals indicated that they had not observed any changes in their teachers' enthusiasm towards the project. One principal felt that a decrease in enthusiasm was displayed by his 2 teachers while 2 other principals observed an increase in their teachers' enthusiasm towards the Cognitive Education Project over the course of the year.

During Year 2, all 9 and in Year 3 both of the respondents indicated that no changes with respect to teacher enthusiasm, were evidenced over the course of the year.

Question #4 During the first year 5 respondents indicated that they had no concerns regarding the administration of the group tests by their teachers. One principal was concerned with the amount of time involved with the testing. During Year 2, all 7 respondents indicated that they had no concerns regarding teacher supervised test administration. In Year 3, both responding principals indicated that no concerns had arisen as a result of the administration of group testing.

Question #7 During year 1, all of the principals who responded to this question (6) indicated that involvement in the project did not create any administrative problems.

During Year 2, 1 of the 8 respondents of this question indicated that administrative problems arose as a result of school participation in the project. This principal further indicated that the testing disrupted the regular programs, it was difficult to find appropriate space for individualized testing and that he was new to the program. During Year 3, 1 of 3 respondents indicated that administrative problems in scheduling the testing disrupted their school year.

Question #9 During Year 1, 4 respondents indicated strong agreement and 2 indicated agreement with the statement that the project team were generally supportive to their schools. During Year 2, 3 principals indicated that they strongly agreed, 2 agreed and 1 was uncertain whether or not the project team had been generally supportive. During Year 3, 1 respondent indicated agree, the other strongly agree with this statement.

Question #10 Three respondents indicated strong agreement, and 4 agreement with the statement, "My consultations with the project team led generally to a satisfactory resolution of problems encountered."

During Year 2, 2 principals indicated strong agreement and 1 indicated uncertainty to the above question. Only 1 principal responded to this question in Year 3. He indicated that he strongly agreed with this statement.

APPENDIX I

Parents' Perceptions of the Cognitive Education Project

Parents' Questionnaire Results

Table 1 Total number of returned Parent Questionnaires by grade, treatment condition, and diagnostic group

		Control			SPELT			IE		
GRADE	LD	Ave	G	LD	Avg	G	LD	AVG	G	TOTAL
4	31	54	28	26	28	35	37	42	42	323
5	4	9	5	20	25	29	26	22	22	162
6	0	0	0	10	9	15	12	9	9	64
7	30	19	10	15	10	15	18	14	10	141
8	15	8	5	8	3	19	11	8	5	82
9	7	8	5	3	0	13	10	7	8	61
Total	87	98	53	82	75	126	114	102	96	833

Table 2 Percentage of responding parents who recognized positive changes in their children in the following areas (by treatment condition and diagnostic group for grade 4 and 7):

Question 1. Attention to home work

Question 2. Time spent dealing with a task

Question 3. Ability to accept criticism

Question 4. Willingness to tackle more difficult tasks

Question 5. Questioning

Question 6. Ability to consider alternative points of view

Question 7. Self confidence

Question 8. Originality in thinking

Question 9. Vocabulary

Grade 4

	Control			SPELT			IE		
	LD	A	G	LD	A	G	LD	A	G
1. home work attention	75	68	12	69	74	70	77	57	68
2. task time	63	52	25	73	71	63	53	58	45
3. accept criticism	42	0	27	31	9	24	24	19	22
4. tackle difficult tasks	67	44	24	67	35	66	68	66	50
5. questioning	100	50	0	92	58	81	73	95	94
6. alternate viewpoints	65	42	50	58	68	52	64	62	76
7. self confidence	87	44	21	73	100	71	81	59	74
8. originality in thinking	78	44	18	71	83	79	69	56	72
9. vocabulary*	- -	- -	- -	100	80	69	72	75	75

* This item was added to the question for the second year of the project in which no grade 4 controls were involved.

Grade 7

	Control			SPELT			IE		
	LD	A	G	LD	A	G	LD	A	G
1. home work attention	58	44	25	87	73	53	41	75	60
2. task time	45	61	11	67	43	60	35	67	70
3. accept criticism	43	33	11	67	50	73	75	8	10
4. tackle difficult tasks	74	63	40	64	75	75	35	85	89
5. questioning	95	79	50	57	60	50	100	100	100
6. alternate viewpoints	61	60	56	86	89	84	67	39	33
7. self confidence	75	53	80	71	78	79	56	86	88
8. originality in thinking	58	71	33	86	88	50	53	79	63
9. vocabulary	50	63	100	69	89	80	100	75	83

Table 3 Percentage of responses for Parent Questionnaire who recognized changes in the following areas (by grade and treatment condition):

Question 1. Attention to home work
Question 2. Time spent dealing with a task
Question 3. Ability to accept criticism
Question 4. Willingness to tackle more difficult tasks
Question 5. Questioning
Question 6. Ability to consider alternative points of view
Question 7. Self confidence
Question 8. Originality in thinking
Question 9. Vocabulary

	Grade 4			**Grade 5**			**Grade 6**	
	Cont.	SPELT	IE	Cont.	SPELT	IE	SPELT	IE
1. home work attention	49	71	67	78	46	72	82	52
2. task time	44	69	52	67	70	57	67	43
3. accept criticism	34	22	22	72	56	58	50	54
4. tackle difficult tasks	43	58	63	78	77	75	70	79
5. questioning	58	77	87	83	77	71	61	72
6. alternate viewpoints	49	59	66	67	73	64	79	54
7. self confidence	44	80	71	72	86	80	80	74
8. originality in thinking	43	78	65	94	90	90	87	80
9. vocabulary	80	83	74	89	86	62	84	79

	Grade 7			Grade 8			Grade 9		
	Cont.	SPELT	IE	Cont.	SPELT	IE	Cont.	SPELT	IE
1. home work attention	47	71	56	72	56	74	60	69	67
2. task time	45	59	54	67	56	68	50	81	67
3. accept criticism	35	67	15	36	46	55	50	70	0
4. tackle difficult tasks	62	71	64	59	48	74	72	88	100
5. questioning	86	56	100	69	59	64	71	100	100
6. alternate viewpoints	60	86	47	63	58	68	82	93	80
7. self confidence	61	76	73	77	85	83	72	100	100
8. originality in thinking	60	72	64	76	76	78	65	94	100
9. vocabulary	64	67	100	67	68	57	71	79	50

APPENDIX J

Inservice Evaluation Report

APPENDIX J

INSERVICE EVALUATION REPORT

Inservices for I.E. and S.P.E.L.T. were held for both Phase 1 and Phase 2 of program implementation. Participants were asked to complete an evaluation questionnaire at the completion of each inservice session (see Appendix K for examples of the questionnaires).

Strategies Program for Effective Learning/Thinking (S.P.E.L.T.) Description of Inservice: Phase 1

Inservice for teachers in the S.P.E.L.T. program was held at one location--the Alberta School for the Deaf--in three parts. Part I was a two-day session held in November 1984. The purpose of this session was to introduce teachers to a number of specific and generic strategies and to demonstrate their use in several subject areas. This session emphasized the direct teaching of strategies (S.P.E.L.T. Phase I). Classroom implementation of the program began in December 1984, following Part I of the inservice.

Part II was a one-day session, held in January 1985, after teachers had implemented some of the strategies in their own classrooms. Instruction during this session focused on the distinction between the teacher-imposed approach of S.P.E.L.T. in Phase I and the student-generated approach of Phase III. It was emphasized that while the two approaches were being presented, the goal of S.P.E.L.T. instruction is to bring students to the place where they are able to generate their own strategies. During Part III, held over two days in February, the emphasis of the course was on the practical integration of strategies with the curricular content. Teachers were asked to devote a minimum of 120 minutes to strategy instruction within their own curriculum and to generalize this teaching to all other content areas wherever possible.

Inservice Evaluation: Phase 1

At the end of each of the three sessions teachers were requested to provide a candid evaluation of the course by responding to a questionnaire (the same questionnaire was administered on all three occasions). The results of the three evaluations are summarized below. They are presented together in order to show changes in teachers' evaluation of the total inservice program as a function of time and increased exposure. Because the sessions were planned to cumulatively integrate the various S.P.E.L.T. components, the ratings were expected to become increasingly positive over the three sessions. Thirty teachers were involved.

The items are grouped under four major categories for ease of interpretation as follows:

a. Qualities of the instructor
b. Course content and underlying theory
c. Teachers' perception of the relevance of the course
d. Group size, time, and audiovisual materials

1. Qualities of the instructor(s).

The November session was taught by one instructor, while the January and February sessions were both taught by a second. Both trainers received very high ratings on items relating to their qualities as instructors. The increase in the percentage of teachers giving a positive rating from January to February is noteworthy. In fact, by the February session all teachers agreed with 4 of the 5 items relating to the instructor's good qualities while 93.8% agreed with the fifth item.

2. Course content and theory.

For the three sessions all respondents agreed that course content was up to date. A drop in the rating on balance between theory and practice was observed in the January evaluation. This low rating (41.3%) is not surprising given the nature of the one-day session in January. The session was intended as a theoretical bridge between two distinct orientations, and it is important to note that as the practical applications followed in the February session, the theory-practice balance rating rose to 75%. In fact, except item 7 on which all respondents agreed all the time, ratings on other content and theory-related items increased from January to February.

3. Relevance of course to teacher's work.

In both the November and January sessions, more than 80% of respondents indicated that the course was relevant to their work. It is significant to note that by the end of the course all respondents found the course to be of relevance. Also by session three, all respondents agreed that their knowledge had been extended; consequently 93.7% of them indicated they would recommend the course to colleagues and friends.

4. Group size, and audiovisual materials.

All respondents considered the class size of 25 to be appropriate. By the end of the course, all respondents indicated that the time allocated to the course was well used and that their time at the presentations was well spent.

The adequacy and meaningfulness of audiovisual materials received a rather poor rating after the November session. Although the situation appears to have improved slightly during the last session, the rating remained poor compared to ratings on all other aspects of the course. It is clear from these evaluations that audiovisual materials represented the single most important area requiring improvement.

Overall Rating

The overall rating of the sessions showed a cumulative improvement. In November only 64.6% of respondents indicated that the purpose for which they attended the course had been well or mostly achieved. This percentage rose to 83% and 93.8% in January and February respectively. Similarly, an increasing percentage of participants rated the course as excellent over the course of the three sessions. It is important to stress that this trend is consistent with the cumulative-integrative organizational approach adopted by the planners of the S.P.E.L.T. inservice program.

Description of Inservice: Phase 2

Inservice for teachers in the S.P.E.L.T. program was held at one location--Lister Hall, University of Alberta--in two parts. Part I was a three-day session held in September 1985, for teachers new to the Project. The purpose of this workshop was to introduce these teachers to both the underlying theoretical model of S.P.E.L.T. and its practical application to classroom use. This was accomplished by exposing them to, demonstrating, and having them practice a number of specific and generic strategies contained in the S.P.E.L.T. manual. Concurrently, they were led through each of the three phases of S.P.E.L.T. by interactively completing a series of activities at each phase which culminated in their operating within Phase III (self-generation of strategies) on the third day of training. This mode of presentation enabled the teachers to experience a similar process as their students would under S.P.E.L.T. instruction, and represented an attempt to model the methodology and strategies which the teachers were expected to put into effect upon returning to their classrooms. Implementation of the S.P.E.L.T. program in the classroom began in September 1985, following Part I of the inservice.

Part II was a two-day session, held in October 1985, and was attended by both first-year teachers and by those who had received inservice training in the 1984 school year and were continuing their involvement in the project. This session was designed to reinforce the initial three days, with a continued emphasis on practical ways to enable their students to reach the stage of self-generation of learning/thinking strategies as a means of systematically approaching their content material. Ideas were presented and lessons modeled by teachers who had earlier taught the S.P.E.L.T. program.

Inservice Evaluation: Phase 2

The results of the evaluation questionnaires administered after both parts of Phase 2 inservice training in S.P.E.L.T. closely paralleled the findings of Phase 1. An exception was the more positive ratings of the clarity and meaning of the audiovisual materials used in Phase 2 training as compared to those in Phase 1. These findings are presented in table form below (see Tables 1 and 2).

For purposes of data analysis and clarity of presentation, the original 5-point scale (falling on a continuum of strongly agree to strongly disagree) has been abridged by combining "strongly agree" and "agree" on the positive end and "strongly disagree" and "disagree" on the negative end to AGREE and DISAGREE respectively. The middle point (Uncertain) has been retained, resulting in a 3-point response scale (Agree, Uncertain, Disagree).

Table 1

S.P.E.L.T. RESPONSES, September 1985 (N=40)

Item	Agree	Uncertain	Disagree
Qualities of Instructor The presenter used effective instructional techniques.	78.6	14.3	7.1
The presenter displayed command of the subject matter.	96.6	3.4	0.0
The presenter showed commitment to this presentation.	100.0	0.0	0.0
The presenter stimulated interest in the topic.	100.0	0.0	0.0
My questions were answered satisfactorily by the person conducting the workshop.	100.0	0.0	0.0
Content/Theory The content of the presentation was up to date.	79.3	17.2	3.4
There was a good balance of theory and practice in the presentation.	96.4	3.6	0.0
The elements of the presentation formed a coherent package.	93.1	6.9	0.0
The theoretical presentation was relevant to my educational concerns.	82.8	17.2	0.0
The theoretical presentation was interesting and stimulating.	93.1	6.9	0.0
The theoretical presentation was high level.	85.7	10.7	3.6

Relevance			
The presentation was relevant to my work.	89.7	10.3	0.0
I would recommend such a presentation to colleagues and friends.	93.1	6.9	0.0
The presentation has extended my knowledge of this area.	74.1	25.9	0.0
Group Size, Time, Audiovisuals			
The size of the group was appropriate.	82.1	17.9	0.0
The time allotted for the presentation was used well.	79.3	17.2	3.4
My time was well spent at the presentation.	82.1	17.9	0.0
The audiovisual materials used were clear and meaningful.	89.7	10.3	0.0

Table 2
S.P.E.L.T. Responses, October 1985 (N=15)

Item	Agree	Uncertain	Disagree
Qualities of Instructor			
The presenter used effective instructional techniques.	92.9	7.1	0.0
The presenter displayed command of the subject matter.	96.4	3.6	0.0
The presenter showed commitment to this presentation.	100.0	0.0	0.0
The presenter stimulated interest in the topic.	96.4	3.6	0.0
My questions were answered satisfactorily by the person conducting the workshop.	96.3	3.7	0.0
Content/Theory			
The content of the presentation was up to date.	82.1	17.9	0.0
There was a good balance of theory and practice in the presentation.	100.0	0.0	0.0
The elements of the presentation formed a coherent package.	89.7	10.3	0.0

The theoretical presentation was relevant to my educational concerns.	85.7	14.3	0.0
The theoretical presentation was interesting and stimulating.	92.6	7.4	0.0
The theoretical presentation was high level.	88.9	11.1	0.0
Relevance			
The presentation was relevant to my work.	96.2	3.8	0.0
I would recommend such a presentation to colleagues and friends.	100.0	0.0	0.0
The presentation has extended my knowledge of this area.	89.3	10.7	0.0
Group Size, Time, Audiovisuals			
The size of the group was appropriate.	92.6	7.4	0.0
The time allotted for the presentation was used well.	84.0	12.0	4.0
My time was well spent at the presentation.	84.0	12.0	4.0
The audiovisual materials used were clear and meaningful.	96.2	3.8	0.0

Tables 3 and 4 summarize responses to general questions from the questionnaires.

Table 3

Extent to Which Purpose for Attending Course Was Achieved (N=40)

Session	Well Achieved	Mostly Achieved	Moderately Achieved	Not Achieved	Other
Sept.	25.9	63.0	11.1	0.0	0.0
Oct.	55.2	44.8	0.0	0.0	0.0

Table 4

Overall Rating of the Course

Session	Excellent	Good	Fair	Poor
Sept.	66.7	33.3	0.0	0.0
Oct.	74.1	25.9	0.0	0.0

Comments written by teachers following the S.P.E.L.T. inservice sessions are summarized below:

September

Most Interesting/Valuable Topics

Topics and concepts which were frequently indicated by participants as being the most interesting or most valuable were:

a. Problem Solving
b. Strategies
c. Time Organization

Positive Aspects of Course Organization and Procedures

Teachers frequently listed the following as aspects of organization they liked most.

a. Sequential progression of ideas
b. Informal friendly atmosphere

Suggested Changes and/or Improvements in Organization/Procedures

a. Allow time to plan lessons specifically for classroom
b. Send information to participants before inservice

Suggested New Topics/Issues to Include in Future Courses

a. Provide catalogue of published and printed materials which could be used as support materials

October

Most Interesting/Valuable Topics

Topics and concepts which were frequently indicated by participants as being the most interesting or most valuable were:

a. Sharing timing
b. Presentation of actual strategies and their implementation
c. Group planning
d. Instructor's presentation style

Positive Aspects of Course Organization and Procedures

Teachers frequently listed the following as aspects of organization they liked most.

a. Instructors' sharing and exchanging of ideas
b. Information was presented and demonstrated in a logical manner
c. Informal atmosphere

Suggested Changes and/or Improvements in Organization/Procedures

a. Allow more time to plan lessons and to share ideas with group

b. Increase time interval between first and second sessions

Suggested New Topics/Issues to Include in Future Courses

a. Increase the amount of time spent on practical (i.e., subject specific) strategies.

Instrumental Enrichment Program (I.E.)

Description of Inservice: Phase 1

Inservice for teachers in the Instrumental Enrichment (I.E.) program was held at two separate locations--Edmonton and Westlock--in November 1984. Instruction was carried out by certified trainers, and thus followed the I.E. standardized presentation. At both centres a two-part format was followed. Parts I and II of the training were intervened by a 10- to 14-day period during which teachers tried out ideas introduced in Part I. During Part II, some time was spent discussing the teachers' brief experiences with the program. At the end of Part II, teachers were requested to provide a candid evaluation of the entire inservice program by responding (anonymously) to a questionnaire.

The I.E. teachers were instructed to place the program within the curriculum wherever it matched their particular situation. The language arts area was suggested as an area where the program would supplement the traditional content. This suggestion was followed by 90% of the teachers; the others replaced instructional time from math and/or optional courses with I.E.

Inservice Evaluation: Phase 1

The results of the evaluation are summarized separately for each of the two centres where I.E. inservicing took place in November 1984.

EDMONTON

The course involved 29 teachers from the following school jurisdictions: Edmonton, St. Albert, Leduc, Wetaskiwin, Sturgeon, Lamont, Stettler and parts of Yellowhead. At the end of each of the second session, teachers were requested to provide a candid evaluation of the course by responding to a questionnaire. For ease of interpretation, the items are grouped under 4 major categories as follows:

a. Qualities of the instructor
b. Course content and underlying theory
c. Teachers' perception of the relevance of the course
d. Group size, time, and audiovisual materials

1. Qualities of the instructor(s)

The course instructors were rated very highly. On 5 items relating to qualities of the instructors, positive ratings ranged from 91.7% on answering teachers' questions satisfactorily to 100% on command of subject and commitment to presentation.

2. Course content and underlying theory

All respondents (n=25) rated the content of the course as up to date while a large majority of respondents thought that: (a) there was a good balance between theory and practice (96.2%; n=26), and (b) content was coherent (85.2%; n=27).

However, items relating to theory received relatively poorer ratings. Only 62.5% of 24 respondents thought the theoretical presentation was of a high level. A slightly higher percentage (69.2% of 26 respondents) found the theory to be interesting and stimulating. Despite the relatively lower rating of theory, 86.9% of 23 respondents thought that the underlying theory was of relevance to their educational concerns.

3. Relevance of course to teachers' work

More than 90% of teachers indicated that the course was relevant to their work and did extend their knowledge. Consequently 92.9% of them indicated they would recommend the course to colleagues and friends.

4. Group size, time, and audiovisual materials

Most respondents (96.5%) found the size of the class (about 30) appropriate for a course of this nature. While 93.1% of 29 respondents thought their time at the course was well spent, a lower percentage (73.1% of 28 respondents) thought "the time allocated for the presentation was used well" (item 6).

Of all the aspects of the inservice program, audiovisual materials received the poorest rating. Only 53.9% of 26 respondents thought that audiovisual materials were clear and meaningful.

Overall Rating

On the whole, 96% of respondents (n=24) indicated that the purpose for which they attended the course was either well or mostly achieved. The remaining 4% indicated that the purpose was only moderately achieved. In rating the course as a whole, 66.7% and 33.3% of teachers responded with "excellent" and "good" respectively. No respondents rated the course as fair or poor.

WESTLOCK

The course involved 26 participants from the following school jurisdictions: Athabasca, Lac La Biche, Westlock, Yellowhead, and St. Albert. The responses are summarized in the same manner as those presented above.

1. Qualities of the instructor(s)

The Westlock group, like the Edmonton group, rated the instructors very highly. On the 5 items relating to qualities of the instructors, ratings ranged from 82.6% on the use of effective instructional techniques to 100% on commitment to presentation.

2. Course content and underlying theory

A very high percentage of teachers rated the content of the course as being up to date (91.3%) and as maintaining a good balance between theory and practice (95.7%). These aspects of the course received similarly high ratings among the Edmonton group. Compared to 62.5% for the Edmonton group, 83.3% of Westlock respondents found the theoretical content to be high. Again, 83.3% of Westlock participants found the theory to be interesting and stimulating compared to 69.2% for the Edmonton group. Regarding the perceived relevance of the theory for teachers' concerns, however, the two groups differed in the opposite direction: 65.2% of Westlock participants, compared to 86.9% for Edmonton, found the theory of relevance to their educational concerns.

3. Relevance of course to teachers' work

76% of Westlock participants agreed that the course was relevant to their work, compared to a 95% agreement rate among Edmonton participants. However, as in Edmonton, over 96% of teachers agreed that the course extended their knowledge and that they would recommend it to colleagues and friends.

4. Group size, time, and audiovisual materials

Most respondents (95.8%) considered the class size of about 25 appropriate for a course of this nature. The discrepancy found between items 6 and 9 in the Edmonton group did not occur in the Westlock session. Essentially, a majority of participants agreed that their time was well spent and that the time allocated for the presentation was well used.

Overall Rating

On the whole, 87% of respondents (n=23) indicated that the purpose for which they attended the course was either well or mostly achieved; 8.7% of participants thought the objective was only moderately achieved. One respondent in this group indicated that the purpose was not achieved. In rating the course as a whole, 70.8% and 25% of participants found the course to be excellent or good respectively. One respondent rated the course as fair.

The main positive aspects of the course organization and procedures listed by teachers in the I.E. inservice program were practical aspects of lesson planning, holding inservice in two parts separated by a 2-week break, varied and insightful presentation by instructors, and active interactions during the sessions. On the other hand, teachers suggested a decrease in the length of course day and an increase in the number of days. It was also suggested that, in the future, more information about the program be given before asking for a commitment from teachers. The topics/issues which were suggested for future inservice sessions included exercises on lesson planning, integration of the program into regular school curriculum, and the relationship between instruments and daily real life situations.

Description of Inservice: Phase 2

Inservices for teachers in the Instrumental Enrichment (I.E.) program, both levels 1 and 2, were held simultaneously at the Alberta School for the Deaf, in October 1985. A two-part format was followed for both levels. Parts I and II of the training were intervened by a 10- to 14-day period during which teachers tried out ideas introduced in Part I. During Part II, some time was spent discussing the teachers' brief experiences with the program. The results of the evaluation are summarized separately for each of the two levels (see Tables 5 & 6, below).

Table 5

Instrumental Enrichment Responses Level 1, Fall 1985 (N=63)

Item	Agree	Uncertain	Disagree
Qualities of Instructor			
The presenter used effective instructional techniques.	100.0	0.0	0.0
The presenter displayed command of the subject matter.	100.0	0.0	0.0
The presenter showed commitment to this presentation.	100.0	0.0	0.0
The presenter stimulated interest in the topic.	100.0	0.0	0.0
My questions were answered satisfactorily by the person conducting the workshop.	100.0	0.0	0.0
Content/Theory			
The content of the presentation was up to date.	93.8	6.2	0.0
There was a good balance of theory and practice in the presentation.	100.0	0.0	0.0
The elements of the presentation formed a coherent package.	87.5	12.5	0.0

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The theoretical presentation was relevant to my educational concerns.	93.8	6.2	0.0
The theoretical presentation was interesting and stimulating.	100.0	0.0	0.0
The theoretical presentation was high level.	93.8	6.2	0.0
Relevance			
The presentation was relevant to my work.	100.0	0.0	0.0
I would recommend such a presentation to colleagues and friends.	100.0	0.0	0.0
The presentation has extended my knowledge of this area.	75.0	18.8	6.2
Group Size, Time, Audiovisuals			
The size of the group was appropriate.	100.0	0.0	0.0
The time allotted for the presentation was used well.	100.0	0.0	0.0
My time was well spent at the presentation.	93.8	6.3	0.0
The audiovisual materials used were clear and meaningful.	100.0	0.0	0.0

Table 6
Instrumental Enrichment Responses Level 2, Fall 1985 (N=46)

Item	Agree	Uncertain	Disagree
Qualities of Instructor			
The presenter used effective instructional techniques.	96.9	3.1	0.0
The presenter displayed command of the subject matter.	97.1	2.9	0.0
The presenter showed commitment to this presentation.	100.0	0.0	0.0
The presenter stimulated interest in the topic	100.0	0.0	0.0
My questions were answered satisfactorily by the person conducting the workshop.	97.2	2.8	0.0

Content/Theory			
The content of the presentation was up to date.	76.0	20.0	4.0
There was a good balance of theory and practice in the presentation.	100.0	0.0	0.0
The elements of the presentation formed a coherent package.	91.7	8.3	0.0
The theoretical presentation was relevant to my educational concerns.	88.8	5.6	5.6
The theoretical presentation was interesting and stimulating.	91.7	2.7	5.6
The theoretical presentation was high level.	88.9	11.1	0.0
Relevance			
The presentation was relevant to my work.	90.9	6.1	3.0
I would recommend such a presentation to colleagues and friends.	91.2	5.9	2.9
The presentation has extended my knowledge.	68.6.	17.1	14.3
Group Size, Time, Audiovisuals			
The size of the group was appropriate.	82.9	14.0	5.7
The time allotted for the presentation was used well.	93.9	3.0	3.0
My time was well spent at the presentation.	96.9	3.1	0.0
The audiovisual materials used were clear and meaningful.	97.0	0.0	3.0

Table 7

Extent to Which Purpose for Attending Course Was Achieved

Session	Well Achieved	Mostly Achieved	Moderately Achieved	Not Achieved	Other	
Level 1	62.5	31.3	6.2	0.0	0.0	N=63
Level 2	57.6	39.4	3.0	0.0	0.0	N=46

Table 8

Overall Rating of the Course

Session	Excellent	Good	Fair	Poor	
Level 1	93.8	6.3	0.0	0.0	N=63
Level 2	64.5	35.5	0.0	0.0	N=46

Comments written by teachers following the I.E. inservice sessions are summarized below:

LEVEL 1

Most Interesting/Valuable Topics

Topics and concepts which were frequently indicated by participants as being the most interesting or most valuable were:

a. Instruments
b. Cognitive deficiencies
c. Bridges
d. Cognitive map

Positive Aspects of Course Organization and Procedures

Teachers frequently listed the following as aspects of organization they liked most.

a. The presence of two instructors
b. Alternating topics
c. Variety of presentation

Suggested Changes and/or Improvements in Organization/Procedures

a. Decrease length of day and increase number of days
b. Include a panel discussion by people who have taught the program

Suggested New Topics/Issues to Include in Future Courses

a. Add reading list of possible books

b. Relate information to relevant research pertaining to learning modalities and right/left hemisphere

LEVEL 2

Most Interesting/Valuable Topics

Topics and concepts which were frequently indicated by participants as being the most interesting or most valuable were:

a. Instruments
b. Bridges
c. Lesson Planning
d. Development of Principles

Positive Aspects of Course Organization and Procedures

Teachers frequently listed the following as aspects of organization they liked most.

a. Instructors were excellent and credible models
b. Holding inservice in two parts separated by a break for practice implementation in the classroom
c. Informal nature of presentation and interactions
d. Bridges and credibility of program
e. Practical aspects of planning lesson and using manual

Suggested Changes and/or Improvements in Organization/Procedures

a. Decrease length of day and increase number of days
b. Group teachers according to grade level taught
c. Omit night session

Suggested New Topics/Issues to Include in Future Courses

a. Provide activity suggestions for children who finish early
b. Provide more detailed descriptions of history of program

APPENDIX K

Questionnaire Forms

BEST COPY AVAILABLE

COGNITIVE EDUCATION PROJECT
TEACHER QUESTIONNAIRE
FORM T3: TRADITIONAL INSTRUCTION

School ____ Date ______________

Please check one of the following:

☐ Regular Classroom Teacher ☐ Resource Room Teacher

Grade Level Taught ____

Class Size ____

1. My consultations/contacts with project team members were:
   ☐ by telephone ☐ through visits by team member(s) ☐ both telephone and visits ☐ by mail
2. I received clear instructions from the project team on the administration of group tests.
   ☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree
3. Did you have any concerns with being asked to administer group tests to your students?
   ☐ Yes ☐ No
4. If your answer to the preceding question was "yes," please list your concerns.
   ____
   ____
5. Results from the Canadian Achievement Test were made available to me?
   ☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree
6. The information from the Canadian Achievement Test results was useful to me as a teacher.
   ☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree
7. What changes in students' attitude/interest did you observe during the course of the project? ____
   ____
   ____
8. Have you observed any positive changes in your students in the following areas:

	Yes	No
a. academic performance	☐	☐
b. self-image and pride in performance	☐	☐
c. eagerness to work (study)	☐	☐
d. attention span/time on task	☐	☐

e. ability/readiness to cope with more difficult tasks [ ] [ ]

f. tendency to ask questions [ ] [ ]

9. Have you taught any strategies to your students in the course of the year?

[ ] Yes [ ] No

10. If your answer to the last question was "Yes," please give examples of strategies you have taught.____

____

11. Will you continue to use any of the assessment tools employed in this project?

[ ] Yes [ ] No

12. Which particular test(s) do you plan to use? ____________________

____

13. Additional comments regarding the project ____________________

____

COGNITIVE EDUCATION PROJECT
TEACHER QUESTIONNAIRE
FORM T1: INSTRUMENTAL ENRICHMENT (IE)

School __________________________________ Date ______________

Please check one of the following:

[ ] Regular Classroom Teacher [ ] Resource Room Teacher

Grade Level Taught ____

Class Size ____

PART I

1. I found the Cognitive Education Project team generally supportive.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
2. My consultations with the project team led generally to a satisfactory resolution of issues/problems raised.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
3. My consultations/contacts with project team members were:
   [ ] by telephone [ ] through visits by team member(s) [ ] both telephone and visits [ ] by mail
4. I received clear instructions from the project team on the administration of group tests.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
5. Did you have any concerns with being asked to administer group tests to your students?
   [ ] Yes [ ] No
6. If your answer to the preceding question was "Yes," please list your concerns.
   ____
   ____
7. Results of the group achievement test (CAT) administered to my students were made available to me.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
8. The information from the CAT results was useful to me as a teacher.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
9. I found the inservice training to be adequate in preparing me to implement Instrumental Enrichment procedures in my class.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

10. I felt reasonably competent beginning instruction in Instrumental Enrichment after the inservice training.

[ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

11. What suggestions would you make for improving the inservice training program in the future? ____

____

____

12. Did you receive any follow-up visits by project staff after inservice training?

[ ] [ ] No If "Yes," how many times?_____

13. If your answer to the last question was "Yes," were these visits helpful to you in carrying out the experimental procedures?

[ ] Very helpful [ ] Helpful [ ] Slightly helpful [ ] Not helpful

14. Did you find the three 40-minute periods per week allotted for instruction in Instrumental Enrichment adequate?

[ ] Yes [ ] No

15. How much time in total (hours) was allocated to IE?__________________

16. If your answer to the last question was "No," should the instruction time be reduced or increased?

[ ] Reduced by ____________ [ ] Increased by __________________

17. Instructional materials were appropriate for grade level.

[ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

18. What were the initial reactions of the students to the new method of instruction?

____

____

19. What changes in students' attitude/interest did you observe during the course of the project? ____

____

____

20. Did you find the Instrumental Enrichment procedures suitable for group instruction given the number of students in your class?

[ ] Yes [ ] No

21. If your answer to the last question was "No," what class size do you think will be most appropriate for group instruction in IE and why? ________________

____

____

22. Have you observed any positive changes in your students in the following areas:

	Yes	No
a. academic performance	[ ]	[ ]
b. self-image and pride in performance	[ ]	[ ]
c. eagerness to work (study)	[ ]	[ ]
d. attention span/time on task	[ ]	[ ]
e. ability/readiness to cope with more difficult tasks	[ ]	[ ]
f. tendency to ask questions	[ ]	[ ]

23. Did you develop procedures to ensure that students would use the strategies acquired through the Instrumental Enrichment program in other subjects and/or classrooms?

[ ] Yes [ ] No

24. Did you find that students were using strategies learned in the Instrumental Enrichment program in other subjects and/or classrooms?

[ ] Yes [ ] No

25. Have you received any questions from parents regarding what this experimental program is all about?

[ ] Yes [ ] No

26. Please provide a brief summary of the types of questions asked____________

____

____

27. Have you received any comments or questions from parents that seem to suggest that they have noticed changes in their child's behavior, attitude to school work, etc., since the beginning of this experimental program?

[ ] Yes [ ] No

28. Please list the kinds of changes that parents seem to have observed, indicating the nature of the change. ____________________________

____

29. Participation in the Cognitive Education Project has enhanced my professional development.

[ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

30. I would continue to use the IE procedures in my class even after my involvement with this project.

[ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

31. I would recommend IE to other teachers.

[ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

32. Additional comments ______________________________

____

____

COGNITIVE EDUCATION PROJECT
TEACHER QUESTIONNAIRE
FORM T2: STRATEGIES PROGRAM FOR EFFECTIVE LEARNING AND THINKING (SPELT)

School ______________________________ Date ________________

PART I

Please check one of the following:

[ ] Regular Classroom Teacher [ ] Resource Room Teacher

Grade Level Taught __________________ Class Size _______________

---

1. I found the Cognitive Education Project team generally supportive.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
2. My consultations with the project team led generally to a satisfactory resolution of issues/problems raised.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
3. My consultations/contacts with project team members were:
   [ ] by telephone [ ] through visits by team member(s) [ ] both telephone and visits [ ] by mail
4. I received clear instructions from the project team on the administration of group tests.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
5. Did you have any concerns with being asked to administer group tests to your students?
   [ ] Yes [ ] No
6. If your answer to the preceding question was "Yes," please list your concerns.
   ____
   ____
7. Results of the group achievement test (CAT) administered to my students were made available to me.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
8. The information from the CAT results was useful to me as a teacher.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree
9. I found the inservice training to be adequate in preparing me to implement SPELT procedures in my class.
   [ ] Strongly Agree [ ] Agree [ ] Uncertain [ ] Disagree [ ] Strongly Disagree

10. I felt reasonably competent beginning instruction in SPELT after the inservice training.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

11. What suggestions would you make for improving the inservice training program in the future? ______________________________

____

____

12. Did you receive any follow-up visits by project staff after inservice training?

☐ ☐ No If 'yes," how many times? _____

13. If your answer to the last question was "Yes," were these visits helpful to you in carrying out the experimental procedures?

14. Did you find the three 40-minute periods per week allotted for instruction in SPELT adequate?

☐ Yes ☐ No

15. If your answer to the last question was "No," should the instruction time be reduced or increases?

☐ Reduced by ____________ ☐ Increased by ____________

16. How much time in total (hours) was spent on instruction in SPELT?_________

17. In what subject area(s) did you provide SPELT instruction?_____________

____

____

18. What were the initial reactions of the students to the new method of instruction?

____

____

19. What changes in students' attitude/interest did you observe during the course of the project?______________________________

____

20. Did you find the SPELT procedures suitable for group instruction given the number of students in your class?

[ ] Yes [ ] No

21. If your answer to the last question was "No," what class size do you think will be most appropriate for group instruction in SPELT? ____________________

____

22. Have you observed any positive changes in your students in the following areas:

	Yes	No
a. academic performance	[ ]	[ ]
b. self-image and pride in performance	[ ]	[ ]
c. eagerness to work (study)	[ ]	[ ]
d. attention span/time on task	[ ]	[ ]
e. ability/readiness to cope with more difficult tasks	[ ]	[ ]
f. tendency to ask questions	[ ]	[ ]

23. Did you develop procedures to ensure that students would use the strategies acquired through the SPELT program in other subjects and/or classrooms?

[ ] Yes [ ] No

24. Did you find that students were using strategies learned in the SPELT program in other subjects and/or classrooms?

[ ] Yes [ ] No

25. Which particular strategies seemed to be most helpful to students? __________

____

____

26. Which particular strategies seemed to generalize easily to other subject areas?

____

____

27. Have you received any questions from parents regarding what this experimental program is all about?

[ ] Yes [ ] No

28. Please provide a brief summary of the kinds of questions asked ____________

____

29. Have you received any comments or questions from parents that seem to suggest that they have noticed changes in their child's behavior, attitude to school work, etc., since the beginning of this experimental program?

[ ] Yes [ ] No

30. Please list the kinds of changes that parents seem to have observed, indicating the nature of the change. ____________________

____

____

31. Participation in the Cognitive Education Project has enhanced my professional development.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

32. I would continue to use the SPELT procedures in my class even after my involvement with this project.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

33. I would recommend SPELT to other teachers.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

34. Additional comments regarding the project ____________________

____

____

PART II

If you have taught program for two years now please answer the following questions:

1. After two years teaching the program I found that students displayed an increased change compared to end of the first year in:

	unsure	yes	no
a. vocabulary level	☐	☐	☐
b. attention concentration	☐	☐	☐
c. self image and pride in performance	☐	☐	☐
d. eagerness to work study	☐	☐	☐
e. ability readiness to cope with more difficult tasks	☐	☐	☐
f. tendency to ask questions	☐	☐	☐
g. greater use of principles/strategies in other curriculum areas	☐	☐	☐

2. After two years of teaching SPELT do you now feel that the program should be implemented in all regular classrooms at your grade level.

☐ Yes ☐ No ☐ unsure

3. Do you feel that the SPELT program is more effective for some students than others.

☐ Yes ☐ No

4. If you answered "Yes," for the above, which of the following students do you think it is the most effective for:

   ☐ Average ☐ Gifted ☐ Learning Disabled ☐ Mildly Retarded

5. Please list below any comments you would like to make regarding the implementation of SPELT in classrooms which you feel would allow for the most adequate implementation.

COGNITIVE EDUCATION PROJECT

TEACHER'S FOLLOW UP QUESTIONNAIRE

TEACHERS WHO WERE TRAINED IN ONE OF THE FOLLOWING COGNITIVE EDUCATION

PROGRAMS: IE ______________ SPELT ________________

School ____________________________ Gr.______ Teacher___________

1. Are you teaching the program in its entirety to your present class?

   [ ] Yes [ ] No Why/Why Not?

2. Are you teaching certain aspects of the program to your present class?

   [ ] Yes [ ] No Why/Why Not?

3. Given the opportunity, (i.e., time, materials, etc.) would you choose to teach the program in its entirety to your class?

   [ ] Yes [ ] No Why/Why Not?

4. Having gone through the inservice training and implementation would you recommend this program approach to your colleagues?

   [ ] Yes [ ] No

5. What type of student do you feel this program is best suited for?

6. Additional Comments/Suggestions

COGNITIVE EDUCATION PROJECT
ADMINISTRATOR QUESTIONNAIRE
FORM A1: SCHOOL PRINCIPALS

School Jurisdiction ______________________________

Date ______________________________

Title/Position of Respondent:

[ ] Principal [ ] Vice Principal

Number of teachers involved in program ______________________________

---

1. Did the teacher(s) involved in the project from your school brief you about the details of the experimental program after inservice training?

   [ ] Yes [ ] No

2. On a scale of 1 to 5 with 1 representing the lowest and 5 the highest level, how would you rate the enthusiasm of your teacher(s) in the program immediately after inservice?

   (Please complete one response line for each participating teacher in your school).

   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #1)
   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #2)
   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #3)
   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #4)
   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #5)
   [ ]1 [ ]2 [ ]3 [ ]4 [ ]5 (Tr. #6)

3. Over the course of the program did you observe any change in your teacher's/teachers' enthusiasm that you feel would be related to the project?

   (Please complete on response line for each participating teacher in your school).

   [ ] No [ ] An increase [ ] A decrease (Tr. #1)
   [ ] No [ ] An increase [ ] A decrease (Tr. #2)
   [ ] No [ ] An increase [ ] A decrease (Tr. #3)
   [ ] No [ ] An increase [ ] A decrease (Tr. #4)
   [ ] No [ ] An increase [ ] A decrease (Tr. #5)
   [ ] No [ ] An increase [ ] A decrease (Tr. #6)

4. Did you have any concerns with the administration of group tests by your teachers on behalf of the project team?

☐ Yes ☐ No

5. If your answer to the last question was "Yes," please list these concerns

6. Have other teachers on your staff requested for inservicing from participating teachers?

☐ Yes (Please state number ...) ☐ No

7. Did your school's participation in this project create any administrative problems for you?

☐ Yes ☐ No

8. If your answer to the last question was "Yes," please list these problems

9. I personally found the project team from the University of Alberta generally supportive.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

10. My consultations with the project team led generally to a satisfactory resolution of problems encountered.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

11. Additional comments on the project

COGNITIVE EDUCATION PROJECT PRINCIPAL'S FOLLOW UP QUESTIONNAIRE

Experimental Condition __________

School Jurisdiction ____

1.. Based on feedback received from my participating teacher(s), I am willing to consider adoption of the experimental procedures for my school.

[ ] Yes [ ] Uncertain [ ] No

Why?____

____

____

2. Based on my school's experience, I would recommend the cognitive education procedures to all schools.

[ ] Yes [ ] Uncertain [ ] No

Why?____

____

____

3. Further Comments

____

____

COGNITIVE EDUCATION PROJECT
PARENT QUESTIONNAIRE

Student's Name ______________________________

Date ______________________________

School ______________________________

Responding Parent: ☐ Mother ☐ Father ☐ Both Mother & Father ☐ Other

---

Please respond to the following questions ON THE BASIS OF YOUR PERCEPTION/OBSERVATIONS ABOUT YOUR CHILD SINCE LAST SEPTEMBER.

Have you observed any increases in your child's behavior in the following areas:

		Yes	No
1.	Attention to home work	☐	☐
2.	Time spent dealing with a task	☐	☐
3.	Ability to accept criticism	☐	☐
4.	Willingness to tackle more difficult tasks	☐	☐
5.	Questioning	☐	☐
6.	Ability to consider alternative points of view	☐	☐
7.	Self Confidence	☐	☐
8.	Originality in thinking	☐	☐
9.	Vocabulary	☐	☐

Please provide additional comments concerning your child's involvement in the Cognitive Education Project: (In particular we are interested in changes which you feel might be a result of the program).

____

____

____

____

____

APPENDIX L

Interest Generated Outside of The Cognitive Education Project

Interest Generated Outside of The Cognitive Education Project

The project has generated considerable interest from administration, teachers and parents in school systems not directly involved in the project. There have been requests for awareness inservices, inservice training and research requests with respect to both of the two learning-thinking programs.

To date the following are a sampling some of the requests have been received by the project team:

Local

1. Inuvik, N.W.T., Regular Classroom teachers, November, 1985 (SPELT).
2. Alberta Association for Children and Adults with Learning Disabilities, Annual Conference, November, 1985 (SPELT).
3. Edmonton Public School Board, Special Education Consultants, January, 1986 (SPELT).
4. Fairview College, Staff, February, 1986 (SPELT).
5. Fort McMurray, Special Education Teachers, February, 1986 (SPELT).
6. Vermilion School District, Professional Development Day, February, 1986 (I.E.).
7. Lakeland College, Staff, March, 1986 (SPELT).
8. Evansview Elementary School, Evansburg, Staff, April, 1986 (SPELT).
9. Dr. Folkins School, Chauvin, Staff, April, 1986 (I.E.).
10. Irma Elementary School, Staff, May, 1986 (SPELT).
11. Parent Training pilot project (sponsored by ACLD) Oct-May, 1986 (I.E.).
12. Parent Awareness Workshop, (ACLD) March-May, 1986 (I.E.).
13. Junior High School Administrator's Meeting, Ponoka, May, 1986 (SPELT).
14. Inuvik, N.W.T., Regular Classroom Teachers, May, 1986 (SPELT).
15. Strathmore County, Special Education Teachers and Consultants, June, 1986 (SPELT).
16. Barrhead Elementary School, Staff, September, 1986 (SPELT).
17. Edmonton Public School System Odessey Program, request for consultation regarding evaluation of program, September, 1986.
18. Swan Hills Elementary and Junior High School, Staff, October, 1986 (SPELT).
19. Barrhead Junior High School, Staff, October, 1986 (SPELT).
20. Lorne Jenkins H.S., Barrhead, Staff, October, 1986 (SPELT).
21. Provincial Special Education Conference, ATA, Banff, October, 1986 (SPELT).

22. Strathcona Local #6 & Sherwood Park Catholic Separate, Local, A.T.A., November, 1986 (SPELT).
23. Wainwright Elementary School, Staff, November, 1986 (SPELT).
24. Developmental Disabilities Conference, U. of A., December, 1986 (SPELT).
25. Fort McMurray, Peter Pond School Staff, February, 1987 (SPELT).
26. County of Ponoka, & Ponoka L.D. Association, Teachers, Parents and Administrators, March, 1987 (SPELT).
27. L.Y. Cairns School, Request for assistance in developing Learning/Thinking Skills Curriculum, March 1987- June 1988.
28. Lakeland College, Adult Literacy Tutors, Alberta & Saskatchewan, March, 1987 (SPELT).
29. Alberta Vocational College, Edmonton, Teachers, Consultants and Administrators, March-May, 1987 (SPELT).
30. Provost School Staff, November, 1987 (SPELT).
31. Cardston Association for Children and Adults with Learning Disabilities, January, 1988 (SPELT).
32. Alberta Vocational Centre, Edmonton, Professional Development Day Presentation. February, 1988 (SPELT).
33. Edmonton R.C. Separate School District Science Teachers, March, 1988 (SPELT)
34. Universities Faculty Development Network, Edmonton, March, 1988 (SPELT).
35. Wetaskiwin County Teacher Professional Development Day Presentation, June, 1988 (SPELT).
36. Beyond the Three R's Conference presentation sponsored by Athabasca University Tutorial Service, Edmonton, October, 1988 (SPELT).
37. Inter-departmental Seminar, Department of Psychology Developmental Lunch, November, 1988 (I.E. & SPELT).
38. Inservice Training for Queen Street School Staff, Spruce Grove, Alberta, February-June, 1989 (SPELT).
39. Athabasca University Tutorial Services Spring Seminars, Calgary & Edmonton, April, 1989 (SPELT).
40. Presentation to Glenrose Rehabilitation Hospital's Psychological Services Staff, April, 1989 (SPELT).

National

There has been some national interest in the project, as evidenced by requests to present the programs and overview of study at national conferences and in national journals.

1. Canadian Society for Study in Education, Presentation June, 1985, Montreal.
2. Canadian Society for Study in Education Conference, Invited Presentation, June, 1986, Winnipeg.
3. St. John's Newfoundland Research Program, Spencer Fellowship Research Foundation Harvard, "to implement and evaluate SPELT program within St. John's Public School System Resource Rooms," Sept., 1986.
4. Request to submit papers on strategy teaching programs to Special Education in Canada.
5. Canadian Society for Study in Education, Symposium Presentation, May, 1987, Hamilton.
6. Canadian Psychological Association, Symposium Presentation, June, 1987, Vancouver.
7. "Thinking......for a Change" International Conference Presentation, Edmonton, August, 1988.
8. Inservice with Onion Lake Tribal Council schools & Department of Indian Affairs officials, June, 1989 (SPELT).
9. Research project University of Victoria on SPELT in elementary schools. 1991-92.

International

The project has begun to receive some international recognition. This includes:

1. American Educational Research Association, Annual Meeting Presentation, April, 1987, Washington, D.C.
2. South Korea, Proposal-to Translate SPELT Program into Korean.
3. Bahamas Proposal-to Examine the SPELT Program with respect to Teacher Training.
4. Request to conduct Inservice Training at Marymount International School, London, England, September, 1989 (SPELT).
5. The development and publication of a book entitled *Learning with Computers: Effective Teaching Strategies* (Ryba, K. & Anderson, B.) @ Massey University, New Zealand, drawing heavily on the SPELT Instructional Model and strategies.

6. Inservice training and reasearch site established in Australia and New Zealand University of New England , Armidale Australia,June,1990(SPELT).
7. Inservice awareness seminars National Institute of Education Singapore, March 1991(SPELT).
8. Pilot project on SPELT with students with learning difficulties. S.N.D.T. Womens University Bombay India, 1991-92.